IMPROVING THE BEHAVIORAL TREATMENT OF OBESITY IN ADULTS

By

PAMELA R. FULLER

A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

1994

ACKNOWLEDGEMENTS

I would like to express my sincere appreciation to my chairman, Dr. Michael Perri, for the significant amount of time, expertise, and support that he gave me during this project. I also want to thank the other members of my doctoral committee, Dr. James Johnson, Dr. Suzanne Johnson, Dr. Maria Grant, and Dr. Dan Martin for their individual contributions. I extend my appreciation to all the weight-loss therapists, especially Timothy Pearman, Elizabeth Leermakers, and Cheryl Porter, who put significant time and effort into the project. I am grateful to Dr. Laura Guyer and her graduate students for their extensive clinical and research support. Finally, I am grateful for the continuous support and encouragement that I have received from my husband during graduate school and from my parents throughout my academic career.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Abstract of Dissertation Presented to the Graduate School of the University of Florida in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

IMPROVING THE BEHAVIORAL TREATMENT OF OBESITY IN ADULTS

By

PAMELA R. FULLER

August 1994

Chairperson: Dr. Michael G. Perri
Major Department: Clinical and Health Psychology

The efficacy of behavioral treatments of obesity may be improved by tailoring group interventions to the progress of individual participants. The implementation of a personalized system of behavioral acquisition, with specific criteria for mastery of new skills, may allow each group participant to progress at an individualized pace, with reinforcement based on mastery of key changes in eating and exercise behaviors. The current study examined the effects of behavioral treatment using mastery criteria, compared to a standard behavioral intervention. A weight-loss education condition was added to examine the efficacy of a minimal treatment intervention. One hundred and six mildly and moderately obese adults were randomly assigned to one of the three conditions. The

education condition received a series of 6 monthly classes involving lectures and handouts on proper diet, exercise, and behavioral strategies for weight loss. The standard treatment involved 25 weekly sessions of behavioral group treatment for weight loss. The mastery condition also included 25 weekly behavioral group sessions, but participants progressed through nine levels of diet and exercise goals, with personalized pacing of progress and reinforcement contingent on skill acquisition at each level.

Because of the additional health benefits of weight loss for individuals with Type II diabetes, the efficacy of the weight-loss interventions for individuals with diabetes compared to nondiabetic subjects was conducted as an additional component of the study.

Results indicated that both the mastery and standard conditions demonstrated significantly greater weight losses than the education condition, but they did not differ significantly from each other. Both the standard and mastery interventions demonstrated significant and equivalent reductions in caloric intake, fat intake, perceived stress, and depression, and increases in physical activity. These findings suggest that both standard and mastery approaches were effective in producing positive changes in diet, exercise, weight, and emotional well-being. Personalizing treatment through the use of mastery criteria, however, may

not produce better short-term results than standard treatment alone. In addition, results indicated that the education condition was insufficient for producing significant weight loss. Finally, both the diabetic and nondiabetic groups demonstrated equivalent, significant changes in weight loss.

CHAPTER I

INTRODUCTION

Obesity is a prevalent and serious health problem in the United States. Over 25% of Americans are estimated to be obese (Kuczmarski, 1992), and, in 1990, approximately 30% of females and 22% of males were attempting to lose weight through diet and exercise (National Center for Health Statistics, 1992). The chronic nature of obesity and its association with decreased longevity and with greater risk of such diseases as coronary heart disease, hypertension, diabetes, and cancer (Manson, Stampfer, Hennekens, & Willett, 1987; Robinson, Hoerr, Strandmark, & Mavis, 1993; Sjostrom, 1992) render it a major medical challenge for many individuals.

Weight loss can result in beneficial changes in blood pressure, cholesterol, triglycerides, and glucose control (Blackburn & Kanders, 1987; Tremblay et al., 1991). Weight reduction is, therefore, important for reducing risks for disease. Weight reduction has particular benefits for individuals with Type II diabetes and currently is the treatment of choice for management of the disease. Treatments of obesity, however, have met with varied success (Caterson, 1990; Foreyt, 1987; Foreyt & Goodrick, 1991; Safer, 1991).

Although behavioral interventions that combine behavior modification strategies with diet and exercise have proved to be among the most effective for mildly to moderately obese individuals, problems remain. The significant variability in the amount of weight lost by individuals and poor maintenance subsequent to treatment highlight the importance of improving the efficacy of the behavioral approach to weight loss. Additionally, as health care costs have escalated, the importance of determining the minimum amount of intervention required to effect change has become increasingly important.

The current project examined several important issues in weight-loss treatment: the application of a personalized system of skill acquisition using mastery criteria for enhancing treatment effects; the efficacy of a minimal treatment intervention; and the treatment response of individuals with Type II diabetes compared to nondiabetic individuals. The introduction will provide a review of the literature on the behavioral treatment of obesity, describing the benefits of weight loss and highlighting the key factors that have been examined in treatment outcome including: patient variables, treatment variables, diabetes status, adherence, dietary regimen, and exercise. A model is presented to assist in conceptualizing the process of behavioral weight loss interventions. Mastery criteria is proposed as an additional factor that may improve treatment efficacy, and a treatment study which examined the effect of

mastery criteria, minimal intervention, and diabetes status on treatment response is described.

Benefits of Weight-Loss Interventions

Both physical and psychological benefits of weight loss treatment have been demonstrated. Research has provided substantial evidence that weight loss treatment is associated with reductions in risk factors for diseases, such as for diabetes and coronary heart disease (CHD). For example, beneficial changes in triglyceride and cholesterol levels, known cardiovascular disease risk factors, have been demonstrated as a result of weight reduction (Kaplan, Wilson, Hartwell, Merino, & Wallace, 1985; Wing, Koeske, Epstein, Nowalk, Gooding, & Becker, 1987). In individuals with diabetes, weight reduction has been associated with a decrease in blood glucose levels (Henry, Scheaffer, & Olefsky, 1985; Wing, Shoemaker, Marcus, McDermott, & Gooding, 1990) likely resulting from increases in insulin sensitivity (Hughes, Gwynne, Switzer, Herbst, & White, 1984; Wing, Epstein, Nowalk, Koeske, & Hagg, 1985) and insulin secretion (Gumbiner et al., 1990).

Some data suggest that the physical benefits of treatment may be produced by even modest weight loss (for an extensive review, see Kanders & Blackburn, 1992). Wing et al. (1987), for example, examined the effect of a behavioral weight control program on glycemic control in 114 obese adults with Type II diabetes. Results indicated that weight losses of 15

pounds or more were associated with significant improvements in glycosylated hemoglobin levels, fasting blood glucose, and insulin at one year follow-up. Significant improvements in HDL-cholesterol and triglycerides were also observed.

More extensive data have been collected demonstrating the effect of weight loss on risk factors for disease than on direct reductions in morbidity and mortality. The supportive data that does exist regarding morbidity and mortality comes from longitudinal studies examining changes in physical status over time. For example, the Framingham Heart Study, which began following 5209 individuals in 1948, reported an inverse correlation between weight loss and risk for CHD (Hubert, Feinleib, McNamara, & Castelli, 1983). Specifically, a 10% decrease in relative weight was correlated with a 20% reduction in CHD risk. Other studies have demonstrated that reductions in obesity to within a normal weight range can significantly reduce mortality ratios (e.g., Society of Actuaries, 1980). Additional contemporary research is needed to clarify the extent to which weight loss directly affects morbidity and mortality.

Psychological benefits of weight reduction have also been examined. Earlier research indicated that weight reduction adversely affected individuals emotionally, resulting in increased feelings of anxiety and depression (Stunkard, 1957; Stunkard & Rush, 1974). Smoller, Wadden, and Stunkard (1987), however, noted that such studies typically employed

psychodynamic approaches to treatment and more subjective measures of psychological status. Studies utilizing behavioral treatment methods and objective test measures have demonstrated either no effect or positive effects on psychological status (O'Neil & Jarrell, 1992; Wing, Epstein, Marcus, & Kupfer, 1984). In a review of mood changes during behavioral weight loss programs, Wing, Epstein, Marcus, and Kupfer (1984) reported that 6 of 10 studies demonstrated significant reductions in depression or anxiety subsequent to treatment. Other studies also have demonstrated a decrease in the self-report of depressive symptomatology as a result of participation in a behavioral weight loss program (Salata, Marcus, Nowalk, & Blair, 1986; Wadden & Stunkard, 1986; Wing et al., 1987). Furthermore, Kaplan, Hartwell, Wilson, and Wallace (1987) have shown that treatment targeting diet and exercise resulted in significant improvements in quality of life in patients with Type II diabetes, independent of weight loss.

In summary, research indicates that behavioral treatments can have positive physical and psychological benefits for overweight individuals. These potential benefits underscore the importance of continuing to modify the behavioral approach to improve overall efficacy of and individual responsivity to interventions.

Behavioral Weight-Loss Interventions

Behavioral programs generally consist of weekly sessions within a group format that extend for approximately 20 weeks (Wing, 1992). The focus of treatment is on modifying behaviors in order to decrease caloric intake and to increase caloric expenditure to yield a negative energy balance. Behavioral approaches have utilized four general strategies in targeting a negative energy balance: stimulus control, reinforcement of targeted behaviors, self-monitoring of diet, and "modification of the topography of eating," such as by slowing the speed of eating (Perri, Nezu, & Viegener, 1992). Perri et al. (1992) noted that three additional strategies have become standard components of comprehensive behavioral treatment interventions: cognitive restructuring, increased physical activity, and nutritional training.

By the early 1980s, data indicated that behavior therapy consistently produced greater weight losses and lower dropout rates as compared to the traditional low-calorie diet approach to obesity management (Brownell, 1982). More recent data indicate that treatment programs that combine diet, exercise, and behavior modification strategies yield the best long-term results compared to other non-surgical approaches, such as nutrition education and pharmacotherapy (Caterson, 1990; Wing, Epstein, & Marcus, 1990). Both initial effects of treatment and short-term maintenance of weight change have improved with behavioral treatments: weight loss now averages approximately

20 pounds post-treatment and 13 pounds at one-year follow-up (Brownell & Wadden, 1992). Long-term maintenance, however, remains a significant problem. Brownell and Wadden (1986), for example, reported that individuals, on average, regain 36% of the initial weight lost during the year subsequent to treatment. Four-year follow-ups indicate that only a small minority maintain the total amount of weight lost during treatment, and the majority regain a significant amount of the weight lost (Kramer, Jeffery, Forster, & Snell, 1989; Stalonas, Perri, & Kerzner, 1984). These studies highlight the importance of continued efforts to improve maintenance of treatment changes in order to enhance the long-term effect of behavioral interventions (Perri et al., 1992).

Patient Factors and Treatment Outcome

In order to improve the short and long-term effects of behavioral weight loss interventions, research has focused on delineating factors that contribute to treatment outcome. Investigations into baseline predictors of weight loss indicate that initial weight and gender are the only patient characteristics that predict weight loss, with heavier individuals losing more weight than lighter individuals and males losing more weight than females (Wing, 1992). These variables appear to largely reflect the same factor, as gender differences are attributable, at least in part, to differences in initial body weight.

Treatment Factors and Treatment Outcome

Numerous treatment factors also have been investigated for their contribution to outcome. Bennett (1986), in a review of 105 studies of behavioral weight loss interventions, found posttreatment weight loss to be significantly positively related to treatment duration, therapist experience, amount of therapist contact, and family involvement. Treatment length has been found to be positively related to both initial weight loss and maintenance of change (Brownell & Kramer, 1989; Perri, Nezu, Patti, & McCann, 1989). Wing (1992) described three components of treatment as being consistently related to weight loss: caloric reduction, increased exercise, and regular self-monitoring of caloric intake. In addition, Perri, Sears, and Clark (1993) identified relapse prevention training, continued professional contact, social support, and exercise as factors that may enhance long-term maintenance of weight loss. Finally, data indicate that weight-loss education (e.g., regarding nutrition and exercise) is a necessary, but not sufficient component, for effecting behavior change (e.g., Heiby, Gafarian, & McCann, 1989). Nutritional counseling or training, therefore, has become a common component of behavioral treatment programs. Research continues to examine and modify treatment elements to determine the combination of strategies that will optimize outcome.

Diabetes Status and Treatment Outcome

Research indicates that obesity plays a particular role in both the development and management of Type II or non-insulin-dependent diabetes mellitus (NIDDM). Of the over 10 million individuals currently affected by NIDDM in the United States, approximately 80 percent are obese (Cox & Gonder-Frederick, 1992), and weight loss is considered the cornerstone of treatment for managing the disease. Obesity also increases the relative risk of developing diabetes to 2.9 times that of nonobese individuals (VanItallie, 1985). Risk of developing diabetes has been positively associated with upper body fat distribution (Ohlson et al., 1985) and duration of obesity (Everhart, Pettitt, Bennett, & Knowler, 1991). Weight loss, therefore, is critical both for prevention and management of NIDDM in the obese population.

Because of the particular role that obesity treatment plays in development and management of NIDDM, it is important to treatment planning to determine any individual differences in treatment response due to diabetes status. Some data, for example, suggest that individuals with non-insulin-dependent diabetes may have more difficulty in losing weight than nondiabetic individuals. Wing, Marcus, Epstein, and Salata (1987) examined potential differences in weight loss according to diabetes status by comparing 12 obese patients with diabetes and their overweight spouses who were participating in a behavioral weight-loss intervention. Nondiabetic spouses

demonstrated significantly greater weight loss than the patients with diabetes at the end of the 20-week program (Ms = 13.4 kg and 7.5 kg, respectively). Poorer weight loss in the patients with diabetes did not appear to be attributable to diabetic medications, given that no significant differences in weight loss were found between patients on insulin, oral medication, or diet only. Significant differences in caloric intake suggested that outcome was attributable to differences in dietary adherence. Specifically, nondiabetic spouses demonstrated significantly greater reduction in caloric intake than the subjects with diabetes. Similarly, Henry et al. (1985) compared 10 inpatients with Type II diabetes to 5 nondiabetic inpatients, with both groups placed on a VLCD for 36 days. Results indicated that the nondiabetic patients lost significantly more weight than the patients with diabetes.

One possible reason for differences in weight loss may be the effect of diabetes medications on weight loss. Studies have suggested that individuals taking insulin lose less weight than those who are not on insulin therapy (Harris, Davidson, & Bush, 1988; University Group Diabetes Project, 1971). This may be attributable to both psychological reasons, such as fear of hypoglycemic responses when diminishing food intake, and physiological reasons, such as the increase in feelings of hunger associated with the release of insulin in the bloodstream. Results from a study by Wing,

Shoemaker, et al. (1990), however, indicated that weight loss was not related to medication regimen.

To date, only a few studies with limited sample sizes have investigated differences in response to treatment according to diabetes status. Because of the potential clinical implications of these results, further clarification of this issue is important.

Dietary Regimen and Treatment Outcome

Different diets have been examined for their effect on treatment outcome. In general, recommended components of a dietary regimen are caloric restriction and reduction in fat intake. An increase in fiber and reduction in cholesterol also generally are encouraged. Guidelines provided by the National Institutes of Health (1987) placed primary importance on caloric restriction and secondary emphasis on macronutrient composition of the diet. Specifically, the committee suggested a moderate caloric reduction that will produce a gradual weight loss, and a diet consisting of approximately 30% fat, 20% protein, 50% carbohydrate. Research investigating the use of calorie-counting diets and exchange system diets to achieve these goals in persons with Type II diabetes indicate that the two regimens do not significantly differ in effectiveness (Wing, Nowalk, Epstein, & Koeske, 1986).

Emphasizing a low-fat diet is important for both reducing body weight and total serum cholesterol level. Research has

shown that fat intake is significantly correlated with body fatness (Miller, 1991). In addition, total fat intake is inversely related to carbohydrate intake and directly related to total calorie intake (Hammer, Barrier, Roundy, Bradford, & Fisher, 1989). Thus, reduction in fat intake may assist in achieving weight loss, reducing total serum cholesterol, and balancing macronutrients in the diet.

Very-low-calorie diets (VLCDs) have shown promise in producing rapid weight loss and improving glycemic control (Amatruda, Richeson, Welle, Brodows, & Lockwood, 1988; Genuth, 1979; Henry et al., 1985). However, weight is often quickly regained following treatment with VLCDs. In an effort to promote maintenance of weight change, some studies have incorporated the use of VLCDs into a behavioral treatment program. Studies have found that combining the use of a VLCD with behavior therapy improves long-term weight loss compared to use of a VLCD alone, but does not produce better maintenance of weight loss than behavior therapy alone (Wadden et al., 1989; Wadden and Stunkard, 1986).

A similar study by Wing et al. (1991) using subjects with diabetes corroborated these results. Thirty-six subjects with Type II diabetes were assigned to either a standard behavioral treatment (BT) or to a standard behavioral treatment that included the use of a VLCD to examine differences in changes in weight and glycemic control. Subjects in the VLCD condition demonstrated significantly greater reductions in

weight, fasting blood glucose, and glycosylated hemoglobin after the 20-week program compared to the BT group. However, there were no significant differences in weight loss between the two conditions at one-year follow-up due in large part to a regaining of weight in the VLCD condition. Interestingly, the VLCD condition continued to demonstrate significantly better glycemic control than the BT group, which the authors postulated may be due to increased insulin secretion. The cost and risks of VLCDs and the evidence that VLCDs do not significantly enhance weight loss or psychological benefits of treatment compared to standard behavior therapy (Wing, Marcus, Blair, & Burton, 1991) suggest that their general use may not be justified at this time. However, the improvement in long-term glycemic control warrants further investigation to determine its utility for the diabetic population.

In summary, adherence to a well-balanced, low-fat, reduced calorie diet is an important component of a behavioral weight-loss intervention. Efforts to increase adherence to dietary regimen, therefore, is a critical target in enhancing treatment efficacy.

Exercise and Treatment Outcome

Research has indicated that exercise contributes to weight loss and maintenance in the general obese population (Perri et al., 1988; Perri, McAdoo, McAllister, Lauer, & Yancey, 1986; Stalonas, Johnson, & Christ, 1978) as well as in the population of obese individuals with diabetes (Wing,

1992). Wing et al. (1988) examined the effect of adding exercise to a behavioral treatment program on weight loss. Results indicated that the combination of diet and moderate exercise (walking a 3-mile route four times a week) enhanced both short and long-term effects on weight loss compared to subjects in a diet only condition. Additionally, both physical and psychological benefits of exercise have been documented. Benefits include favorable changes in cardiovascular risk factors, such as reductions in blood pressure, triglyceride levels, and cholesterol levels, and improvements in mood (Dubbert, 1992). Given that many of the complications of NIDDM are related to cardiovascular disease, the changes in lipid levels and blood pressure resulting from exercise are particularly advantageous to individuals with Type II diabetes. Additionally, exercise has been shown to improve insulin action by reducing insulin resistance, particularly by diminishing the amount of adipose tissue and by increasing the number of insulin receptors (Sherman & Albright, 1992). Exercise also may ultimately diminish mortality risk. Kohl, Gordon, Villegas, and Blair (1992) followed 8715 men for an average of 8.2 years to examine the relationship between glycemic control, mortality risk, and cardiorespiratory fitness. Their data suggested that, across all levels of glycemic control, men with better cardiorespiratory fitness had a lower mortality risk.

Although the benefits of exercise are potentially significant, positive effects are transient unless changes in activity are maintained. Research indicates that those who continue to exercise are more likely to maintain weight loss (Kayman, Bruvold, & Stern, 1990). Adherence to exercise prescriptions and creating activity regimens that individuals can incorporate into their lifestyles, therefore, is important (National Institutes of Health, 1987). In developing an exercise prescription for the obese population, recommendations must be tempered by considerations of the likelihood and feasibility that the goals can be achieved. The exercise goal in obesity treatment generally approximates the guidelines provided by the American College of Sports Medicine (1991) of exercising 20 to 30 minutes, 3 to 5 times per week (e.g., Monk, Adolphson, Hollander, & Bergenstal, 1988; Wing, Shoemaker, et al., 1990). Like dietary regimen, exercise is a critical part of an effective behavioral intervention, and warrants continued efforts to increase individuals' participation in exercise to produce weight loss.

Adherence and Treatment Outcome

Because the management of obesity is reliant primarily upon self-care behaviors of the individual, adherence to regimen is critical for weight control. Adherence to behavioral treatment regimens for weight loss--such as recording food intake and exercising regularly--is variable, however, and generally worsens subsequent to treatment (Miller

& Sims, 1981; Perri, 1987; Van Dale, Saris, & Hoor, 1990). For patients with diabetes, diet and exercise prescriptions are identified as the most difficult aspects of diabetes management (Glasgow, McCaul, & Schafer, 1986). Given that performance of particular health behaviors is critical for producing and maintaining weight loss in behavioral treatments of obesity, adherence is essential for successful weight management. Although a substantial amount of research has focused on factors that influence adherence, few predictors have been identified. Adherence does not appear to be consistently related to demographic variables, such as race, gender, or socioeconomic status (Levy, 1987; Meichenbaum & Turk, 1987). Levy (1987) described 3 general reasons for nonadherence to regimens: patient has inadequate skills or knowledge to perform the behaviors; patient has a belief system that is incompatible with or unsupportive of the regimen; or the patient's environment interferes with adherence. In addition to patient variables, Meichenbaum and Turk (1987) identified 3 other general factors involved in determining adherence: disease variables (e.g., severity of symptoms); aspects of treatment, such as regimen complexity; and relationship variables, specifically between the patient and health care provider. The importance of self-efficacy expectations (confidence in ability to perform a behavior) for predicting adherence also has been highlighted (McCaul, Glasgow, and Schafer, 1987).

Historically, poor adherence or noncompliance has implied that a patient made a conscious decision not to follow a medical regimen prescribed. In addition, noncompliance traditionally has been conceptualized as a single construct; either a patient was "compliant" or "noncompliant." Recent theoretical and empirical contributions, however, suggest that multiple factors contribute to adherence. For example, the Health Beliefs Model emphasizes the role of cognitive factors--such as perceived severity of illness and potential barriers to health behavior--in determining adherence (Becker, 1974). Research supports the role of health beliefs in predicting the performance of health behaviors (Harris & Linn, 1985; Leventhal, Zimmerman, & Gutman, 1984; Wilson et al., 1986). Johnson (1990) identified knowledge, skills, and patient/physician communication as factors that contribute to the likelihood of adherence in patients with diabetes. Johnson recommended that adherence be approached as a multidimensional construct, with measurements of adherence involving the assessment of separate self-care behaviors rather than of global adherence. Factor analyses of adherence behaviors required of patients with Type I diabetes provide support for this multifactorial approach (Johnson, Tomer, Cunningham, & Henretta, 1990). Performance of self-management skills is an important aspect of successful weight loss, and although research has delineated a number of factors that

influence adherence, a conceptualization of the process by which adherence occurs has been lacking in clinical research.

A Conceptual Framework for Treatment Intervention

The objective of behavioral treatment interventions for obese individuals is to improve patients' adherence to (i.e., performance of) specific self-management behaviors. The success of treatment is contingent upon this objective being met. A model of health behavior change has been developed to conceptualize the process by which this may occur (please see Appendix A). According to the model, various mediating variables affect the likelihood of a change in health behaviors. Changes in health behaviors may then directly result in improved behavioral outcomes (e.g., quality of life) or indirectly affect behavioral outcomes through biological changes. Adherence to health behaviors mediates desired outcomes. Accordingly, specific research for improving the efficacy of behavioral interventions has involved identifying and manipulating factors that affect adherence (i.e., the mediating variables) and delineating the health behaviors necessary for producing the desired outcome.

Application of the model to obesity treatment provides a specific example of this conceptual approach to intervention. In obesity treatment, the targets of intervention are specific health behaviors that will increase the likelihood of weight loss, such as caloric restriction, physical activity, and diminished intake of fat. Changes in these behaviors may be

influenced by such factors as skill level, knowledge of the behavior, and health beliefs, such as perceived self-efficacy. Making changes in these health behaviors may directly enhance quality of life, such as by improving mood, or indirectly enhance the quality of life through biological outcomes like weight loss and diminished CHD risk. For example, for individuals with diabetes, greater glycemic control may improve quality of life by diminishing the need for medications, decreasing the number of diabetic complications, and improving physical functioning. For nondiabetic individuals, weight loss may enhance quality of life by elevating self-esteem or improving capacity for work and other activities.

The focus on behavioral outcomes as the critical measure of treatment efficacy has recently been emphasized in health psychology literature. Kaplan (1990), for example, has argued that behaviors are the most important outcome measures and, therefore, should be the focus of research in behavioral medicine. Kaplan asserts that biological measures and disease parameters are mediators that influence behavioral outcomes and are meaningful only insofar as they affect the quality or longevity of an individual's life. For example, the primary outcome measure in interventions with subjects with Type II diabetes has been blood glucose levels, and improved glycemic control has been considered the primary goal of treatment (Cox & Gonder-Frederick, 1992; National Institutes of Health,

1987). The value of these biological indices, however, is dependent upon their meaning for behavioral outcomes, such as the extent to which diabetic symptoms interferes with daily functioning (physical, social, interpersonal, etc.).

The psychological impact of obesity, including psychological distress related to social discrimination and body-image disparagement (Stunkard, 1976; Wadden & Stunkard, 1985), provide an additional reason for assessing behavioral outcome variables when conducting interventions with obese individuals. Although no significant differences in psychopathology between groups of obese and nonobese individuals not seeking help with weight loss (Wadden & Stunkard, 1985), a significant minority of overweight individuals in clinics or weight loss programs do demonstrate psychological consequences, such as low self-esteem and poor body image, that is related specifically to their obesity. Additionally, some research indicates that psychological well-being improves subsequent to weight loss (Wing et al., 1984). These data highlight the importance of assessing changes in psychological variables when evaluating the success of interventions with this population.

According to the model, methods that increase the likelihood of adherence to weight-management behaviors can have a direct effect on treatment outcome. Determining such methods, therefore, is an important part of improving individuals' response to treatment. The current study

examined the use of a personalized system of skill acquisition using mastery criteria for increasing adherence to weight management behaviors in an effort to improve treatment efficacy.

The Role of Skill Acquisition in Treatment Intervention

Over the last 20 years, improvements in behavioral treatments of obesity have resulted in part from extending the use of behavioral principles for promoting the performance of behaviors, such as the addition of incentive systems and specific skill training (Wing, 1992). In particular, considerable research has focused on factors involved in the maintenance of behaviors necessary for weight management. These efforts have increased the typical weight loss achieved in behavioral treatment to approximately 20 pounds. However, significant variability in patient response to treatment exists (Brownell & Wadden, 1986; Perri et al., 1992), and the majority of individuals who do lose weight gradually regain it after treatment is completed (Brownell & Jeffery, 1987; Wadden & Bell, 1990; Wing et al., 1985). These limitations warrant continued investigation into the components of treatment necessary to enhance both the short and long-term effects of behavioral intervention.

One component of treatment that has not been adequately examined is the acquisition or learning of the behavioral skills necessary for change. Separate variables may be responsible for the acquisition versus the maintenance of

behaviors (Bandura, 1969), and behaviors that are not fully acquired (i.e., not adequately learned) may be poorly maintained. Currently, behavioral treatments are frequently conducted in a group treatment format, with new information and skills introduced at a standardized pace that is relatively independent of individual response repertoires and progress (Perri, 1989). One possible explanation, therefore, for the moderate initial treatment effects and poor maintenance over time is that the interventions may not have been tailored enough to individual differences in skill acquisition to have promoted the learning necessary for behavior change. Improving the initial learning of desired health behaviors, therefore, may improve adherence to these behaviors and overall efficacy of treatment.

Mastery Criteria and Skill Acquisition

The use of mastery criteria for promoting behavior change may be one method for improving the acquisition of behavioral skills necessary for weight loss. The mastery-based approach breaks down behavioral skills into smaller increments, defined by specific criteria, within a number of levels that successively approximate the desired behavior. When criteria for a skill are met, the individual is reinforced, and progresses to a new level where new criteria for the skill are delineated that more closely approximate the end goal. For example, if a dietary goal of 1200 calories per day is established with a patient, mastery criteria on the first

level may be a broad range that includes the 1200 calorie target, such as a range from 1000-1800 calories per day. Once the individual demonstrates an average daily caloric intake within this range for one week, the individual is reinforced. The individual would then progress to Level 2, where criteria for the caloric range would be narrower, such as 1000 to 1500 calories per day. Criteria within successive levels would continue to become narrower until the target goal is reached at the final level. The individual thereby gradually acquires the ability to eat an average 1200 calorie/day diet.

The use of mastery criteria tailors the pace of treatment and reinforcement to the progress of each individual. In this way, interventions may be adapted to individual differences in ability even within a group treatment format. Thus, the use of mastery criteria may improve the efficacy of group treatment by addressing individual variability in performance. The importance of individualizing treatment is highlighted in recent literature (Brownell & Wadden, 1992; Perri et al., 1992). Responding to this need--by tailoring interventions and setting goals according to individual abilities--may increase the likelihood of learning skills and achieving goals. This may, in turn, enhance feelings of self-efficacy in addition to improving maintenance of changes.

The use of mastery criteria for promoting behavior change is supported by learning theory. A basic premise of learning theory is that effective learning occurs through shaping,

which is defined as the contingent, differential reinforcement of successive approximations of the desired behavior (Skinner, 1953). Accordingly, shaping may be used to facilitate acquisition of a new behavior and to increase the probability that the behavior will be emitted. The targeted behavior is separated into a series of progressive responses; when the initial or simplest response is emitted, it is reinforced. A modification of the response (the next response in the series) must then be emitted in order to receive reinforcement. In this manner, a complex behavior is gradually learned by dividing it into simpler responses that are more likely to be performed initially, and therefore are more likely to be reinforced. Additionally, the gradual, sequential learning in this procedure may strengthen and refine the skill being acquired (Skinner, 1953).

The mastery-based approach incorporates several of the principles described by Keller (1966, 1968). His personalized system of instruction (PSI) combined programmed instruction with principles based on operant conditioning theory. In this model, students progress through educational material at a pace commensurate with their abilities. Advancement to new material is contingent upon demonstrating mastery of the preceding material, according to the "unit perfection requirement." Understanding of material is continuously evaluated through quizzes and assignments that accompany each lesson and immediate feedback is provided. This teaching

model applies a variety of behavior principles to improve the learning of new material. The critical components of this approach--the individualized pace, emphasis on mastery of material, and frequent, contingent reinforcement--are utilized in the mastery-based model to promote learning of the information and skills necessary for producing behavior change.

The utility of the mastery-based approach also is supported by specific findings pertaining to dietary change and weight loss. For example, research suggests that gradual changes in diet and exercise are associated with better outcomes in obesity treatments (Foreyt & Goodrick, 1991). In particular, data indicate an inverse relationship between the rate of initial weight loss and maintenance over time (Brownell & Wadden, 1986). These data suggest that gradual changes made using mastery criteria in weight loss treatment may help to enhance maintenance of behavior changes. Ewart (1989) described two important effects of a gradual, successive approach to dietary change: (1) increased frequency of reinforcement due to smaller, more obtainable goals and (2) greater mastery of skills for simpler tasks before progressing to skills requiring a greater level of complexity and difficulty. These characteristics are important components of skill acquisition and a fundamental part of mastery-based intervention.

Research conducted by Epstein et al. (1994) with obese children and their overweight parents support the use of mastery criteria in weight-loss treatment interventions. Children and their parents were assigned to either a standard behavioral weight-loss treatment that progressed at a rate independent of individual skill acquisition or to a standard treatment that paced interventions according to the participant's mastery of specified self-management skills. In the mastery-based condition, children and parents progressed at their own rate in mastering new skills for diet, exercise, and parenting through five progressive levels and they were rewarded each time they mastered skills within a given level. Subjects in the standard treatment also were rewarded at the same frequency, but noncontingently. The results indicated that subjects in the mastery-based condition, parents as well as children, demonstrated significantly greater weight change than subjects in the standard behavioral treatment control group.

Reinforcement is a critical factor in facilitating acquisition of a desired behavior that is highlighted in the mastery-based approach. It is generally accepted that continuous reinforcement schedules are the most appropriate for acquisition of a new behavior and intermittent schedules (particularly variable ratio schedules) are the most effective for long-term maintenance (Catania, 1984). More recent research, however, suggests that the most effective schedule

depends upon the nature of the targeted behavior. Epstein (1992) suggests that, for free operant behavior (as opposed to behaviors that are emitted within specific, structured environments, like a prison), continuous reinforcement schedules are the most effective in promoting resistance to extinction. Weight-loss interventions, then, are more likely to be effective in maintaining changes if the number of individual responses that are reinforced is maximized during the acquisition phase. This may be achieved by providing opportunities for frequent reinforcement within treatment, structuring reinforcers within the social environment, and emphasizing the use of self-reinforcement by the patient.

The mastery-based approach increases the frequency of reinforcement by breaking skills down into increments that result in attaining goals easier and more often. For example, dividing caloric intake goals into ranges that successively become narrower and closer to the final goal increases both the likelihood of achieving the goal and the number of goals that are achieved. Consequently, opportunities for reinforcement are also increased.

In summary, the use of mastery criteria provides a method for tailoring interventions to individuals within a group format and warrants further investigation to evaluate its ability to enhance treatment efficacy.

Minimal Treatment Intervention for Weight Loss

It is widely accepted that behavioral weight-loss treatment produces significantly greater weight loss than no treatment in the general obese population. More recent research has examined simpler, less intensive approaches to weight reduction in order to determine the minimal intervention required to effect significant weight loss (e.g., Black & Threlfall, 1986). Stunkard (1992) noted that evaluations of the effectiveness of obesity treatments must take into account the amount of time and money necessary to produce an outcome. For example, a cost-benefit analysis of the efficacy of standard behavioral treatment compared to a VLCD alone and to a VLCD combined with standard treatment indicated that, although there were minimal differences in weight loss between the three conditions, there was a significant difference in cost by 1-year follow-up (Stunkard, 1987). This type of research has become increasingly more important as managed health care organizations place greater emphasis on utilizing the most cost-effective interventions that yield clinical benefits.

A few studies have examined the efficacy of education or information interventions compared to standard behavioral approaches. Black, Coe, Friesen, and Wurzmann (1984), for example, compared a minimal intervention condition, in which subjects were given three simple verbal instructions initially and returned 7-months later, to a shortened behavioral weight

loss condition on weight loss, which involved weekly behavioral treatment for 6 weeks. The minimal intervention condition also was compared to a "complete" behavioral weight loss condition, consisting of 10 weeks of behavioral treatment. All groups lost a significant amount of weight over time and no significant differences in weight loss between groups were observed. Bibliotherapy programs, which provide written instructions about weight loss with little or no therapist contact, also have been explored as a potentially less intensive and expensive approach to weight loss. Data indicate these programs produce weight losses of between approximately 12 and 15 pounds at 6-month follow-up (Marston, Marston, & Ross, 1977; Pezzot-Pearce, LeBow, & Pearce, 1982). These data are comparable to those cited for 10-week behavioral treatments. However, current behavioral interventions are generally longer than 10 weeks, and it is important, therefore, to replicate results of these studies with programs of more typical length (i.e., at least 20 weeks).

Present Study

The present study examined the effects of behavioral treatment using mastery criteria, compared to a standard behavioral intervention and to a weight-loss education group. Interventions and reinforcement were paced according to individual mastery of specified self-management skills within levels that successively approximated desired goals for diet,

activity, and knowledge. Specific mastery criteria included daily calorie intake, physical activity, macronutrient distribution, knowledge of nutrition and behavior skills, and self-monitoring of eating and exercise habits. By defining personal goals according to the individual's level of competence and progress, intervention within the group setting was tailored to the specific needs of individual members. Given the importance of developing time- and cost-effective interventions, a second goal of the study was to evaluate the efficacy of a minimal weight-loss intervention involving weight-loss education compared to standard behavioral treatment. Finally, because of the significant number of obese individuals either diagnosed with or at risk for Type II diabetes, a third goal of the project was to examine differences in response to treatment between individuals with Type II diabetes and nondiabetic individuals.

Rationale for the Present Study

Weight loss improves hyperlipidemia, hypertension, and glucose tolerance, diminishes mortality risk, and may improve mood and quality of life. Improving the effectiveness of obesity treatment, therefore, may be an important step toward promoting the physical and psychological health of this population. Although efforts to improve behavioral interventions have continued, further research is needed on the acquisition and facilitation of learning for improving outcome. To date, no study has investigated the effects of

using a mastery-based program to enhance learning of desired behavioral skills in obese adults, although both theoretical and empirical evidence suggest that treatment effects may be enhanced by improving skill competency and performance through a more individualized approach.

The present study built upon prior research and responded to recommendations for future investigations in this area. For example, Brownell and Wadden (1992) emphasized the importance of theory in the development and evaluation of treatment. A mastery-based approach to obesity treatment applies behavioral principles regarding acquisition of behavior to facilitate performance of skills necessary for weight management. The present study also responded to other strategies suggested by Brownell and Wadden (1992) for improving the effects of weight loss interventions, such as extending the length of treatment, emphasizing exercise, and teaching relapse prevention techniques. In addition, strategies for improving the fit between the individual and treatment is currently emphasized in obesity treatment literature (Brownell & Wadden, 1992; Perri et al., 1992), and the mastery-based approach provides a unique method for achieving this within a group format by tailoring and pacing interventions according to individual differences and needs. The use of the weight-loss education condition addressed the need to evaluate potentially more cost-effective treatment alternatives. Finally, the ultimate goal of the study, which

was to improve the quality of life of overweight adults, reflects an important shift in this area toward behavioral outcomes in treatment interventions with this population, a shift that is considered to be broader and ultimately more meaningful (Epstein, 1992; Kaplan, 1990).

Hypotheses

The primary hypothesis was that:

The mastery-based behavioral treatment would significantly enhance learning of and adherence to self-management skills related to diet and exercise when compared to each of the two control conditions, weight-loss education and standard behavioral treatment, at posttreatment. Specifically, when compared to the two control conditions at posttreatment, the mastery-based treatment condition was predicted to demonstrate:

1. Lower mean daily caloric intake;
2. Lower mean daily fat intake;
3. Higher mean daily physical activity; and
4. Greater mean knowledge of weight-loss strategies.

Secondary hypotheses were that:

1. The mastery-based behavioral treatment would produce significantly greater reductions in body weight at posttreatment when compared to the standard behavioral treatment and to the weight-loss education condition.
2. The mastery-based behavioral treatment would produce significantly greater improvements in quality of life at posttreatment when compared to the standard behavioral treatment and to the weight-loss education condition.
3. Nondiabetic subjects would demonstrate significantly greater reductions in body weight at posttreatment compared to subjects with Type II diabetes.

CHAPTER II

METHOD

Subjects

One hundred and six subjects, 78 females (73.6%) and 28 males (26.4%), were selected from over 300 individuals recruited by physician referral and advertisement through the local newspaper. Eligibility criteria for participation included being between 25 and 70 years of age, being willing and able to post a $100.00 refundable deposit, and being between 20 and 100 percent over ideal body weight according to the Metropolitan Life Insurance Tables (1983). Women who were pregnant or intended to become pregnant during the 12 months of the study were excluded. In addition, subjects were required to have clearance from their physician indicating that there were no medical contraindications to their participation in the weight loss program, such as co-morbidities or diabetic complications that would render exercise a risk. Of 67 individuals determined to be ineligible for participation through the initial telephone screening, 21% did not meet the age criteria, 31% the weight criteria (18% exceeded the weight criteria, 13% were below it); 21% the time commitment, 13% the exercise requirement, 7% the financial requirement ($100 deposit), and 4% other reasons

(no transportation, recent weight loss, participation in another program). Seven percent declined to participate after the phone screening due to lack of interest. Twenty-seven additional individuals were excluded subsequent to completing an application to participate because of weight requirements (59%), inability to walk for exercise (11%), medical contraindications (7%), current attendance in another weight loss program or recent weight loss (7%), time commitment (4%), age (4%), or prior participation in the program (4%).

Eligible subjects ranged in age from 26 to 70 years, with a mean age of 48.4 years (SD = 10.91). Ethnic origin of the sample was predominantly white (92.5%), with only 4 (3.8%) African-Americans and 4 (3.8%) individuals of Hispanic origin. Twenty-one (19.4%) subjects in the sample were classified as having Type II diabetes, 7 (6.5%) of whom were taking insulin. Average level of education was 14.97 years (SD = 2.51), and the majority (80.3%) reported an annual household income between $21,000 and $60,000. Average initial body weight was 213.82 pounds (SD = 34.01), and ranged from 157.8 to 325.0 pounds. The mean percentage over ideal body weight was 51.26 percent (SD = 18.8), with a range from 20 to 99 percent, and the mean body mass index was 34.41 (SD = 4.24), with a range from 26.6 to 44.1.

Measures

Demographic/Medical Information

The General Information Questionnaire (GIQ) was used to obtain general demographic information as well as specific medical information. Medical information included current symptoms of diabetes and related complications, other current health problems, and a history of medical illnesses. A listing of current medications was obtained and diabetic medications were categorized as no medication, oral hypoglycemic agents, or insulin injections.

Adherence-Related Measures

Calorie and fat intake. Calorie and fat intake was based on a 3-day food record analyzed by a dietician using the Minnesota Nutrient Data System microcomputer dietary analysis system (Nutrition Coordinating Center, 1990). The database includes more than 16,000 food items and brand names, with options allowing more than 150,000 variants of foods. The system has been used in several major research projects, including the National Health and Nutrition Examination Survey (Buzzard & Feskanich, 1987). The Minnesota dietary analysis system has been described as having excellent standardization, specificity, and reliability (Mitchell & Shacklock, 1991; Nieman, Butterworth, Nieman, Lee, & Lee, 1992; Schackel, Sievert, & Buzzard, 1988). Potential sources of error in the computer food analysis include misreadings of food entries,

incorrect data entry, and judgment calls regarding classification of food recordings not listed in the database. As a second measure, a daily average of reported caloric intake was derived from the 7-day food diaries maintained by the subjects.

Physical activity. The Physical Activity Record, a 3-day, self-report activity record developed by Bouchard et al. (1983) was used to measure physical activity. The respondent classified the level of energy cost of activities performed during each 15-minute interval of the day (total = 96 intervals) according to categories ranging from low energy cost (1) to high energy cost (9). A list of the categories and examples of activities were provided to guide responses. The mean daily energy expenditure and frequencies for participation in higher energy expending activities may be derived. Adequate psychometric properties are suggested by a test-retest reliability of .96, a significant positive correlation between energy expenditure and physical working capacity, and a significant negative correlation between energy expenditure and body fatness (Bouchard et al., 1983). As a second measure, a weekly average of exercise (in minutes) calculated from a one-week period was derived from the written record of exercise recorded by subjects.

Knowledge. Knowledge of nutrition, behavior strategies, and exercise was measured by the Nutrition and Exercise Knowledge Questionnaire, a measure recently developed by a

licensed nutritionist (Babroff, 1993). Items were selected to reflect the key elements in weight-loss involving nutrition, behavior strategies, and exercise. Items have face validity and were based on the professional judgment of a licensed nutritionist. Additional information on the psychometric properties of the measure are currently being collected.

Weight-Related Measures

Weight loss was measured according to changes in body weight and body mass index. Weight was measured on a balance beam scale. Height was taken in order to compare actual weight compared to ideal weight specified by the Metropolitan Life Insurance norms (1983) and to evaluate changes in body mass index (kilograms/meters squared).

Quality of Life Measures

Sickness Impact Profile. This is a 136-item survey that examines the impact of illness on health status by measuring the degree of sickness-related behavioral dysfunction (Gilson et al., 1975). The respondent indicates with a check behaviors in which he or she engages. Scores on a physical and a psychosocial dimension are generated in addition to an overall score. Explicit instructions are included with the questionnaire.

Reliability and validity of the measure are very good. Gilson et al (1975) reported test-retest reliabilities ranging

from *r* = .80 to *r* = .88 for the instrument. Bergner, Bobbitt, Pollard, Martin, and Gilson (1976) cited criterion validity measures for the SIP score of *r* = .54 with self-assessment of sickness, *r* = .52 with self-assessment of dysfunction, *r* = .49 with physicians' assessment of dysfunction, *r* = .46 with Activities of Daily Living, and *r* = .46 with the National Health Interview Survey Data.

Beck Depression Inventory-Revised. The BDI (Beck, Rush, Shaw, & Emery, 1979) is a widely-used self-report measure that assesses neurovegetative, cognitive, and affective symptoms of depression. The instrument contains 21 groups of statements reflecting depressive symptoms, such as irritability, crying, somatic preoccupation, and weight loss. The respondent selects from 4 statements within each group the description which best describes his/her behavior during the past week. Each statement is rated on a 4-point scale and the sum of the ratings yields the total score. General cut-offs for the total score indicate the severity of depression (asymptomatic, mild-moderate, moderate-severe, extremely severe). For this study, the item pertaining to recent weight loss was omitted.

The BDI has been widely used for both clinical and research purposes and has demonstrated strong psychometric properties. For example, the manual for the BDI cites high internal consistency values ranging from .79 to .90 in both clinical and nonclinical populations (Beck & Steer, 1987). Concurrent validity has been demonstrated through studies

correlating the BDI with the Hamilton Psychiatric Rating Scale, the Zung Self-rating Depression Scale, the MMPI-D scale, and clinical ratings of depression (Beck & Steer, 1987). Several comprehensive reviews of the BDI provide detailed information regarding the psychometric properties of the instrument (Edwards et al., 1984; Lips & Ng, 1985; Steer, Beck, Riskind, & Brown, 1986).

Perceived Stress Scale. The PSS (Cohen, Kamarck, & Mermelstein, 1983) is a 14-item measure of perceived stress. The scale is comprised of 14 statements that describe thoughts or feelings related to stress and coping. Examples of items include "During the last month, how often have you felt nervous and stressed?" and "During the last month, how often have you felt that things were going your way?" Respondents rate the frequency with which s/he has experienced the statements during the last month on the following scale: 0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, and 4 = very often.

Psychometric data provided by Cohen et al. (1983) indicate adequate reliability and validity of the PSS. They reported an average internal reliability value of r = .85 and a test-retest reliability of r = .85 for a two-week interval and r = .55 for a six-week interval. Additionally, significant correlations between the PSS and life-event scores, depressive and physical symptomatology, and social anxiety on self-report measures were cited as evidence of

concurrent validity of the PSS.

<u>Satisfaction Rating Scale</u>. The Satisfaction Rating Scale is a face valid measure used to obtain additional information about quality of life. Respondents are asked to rate their satisfaction with general areas in their lives such as physical appearance, relationships, activity level, and occupation. Areas are rated on a 7-point Likert scale that ranges from 1 = "Very dissatisfied" to 7 = "Very Satisfied."

<u>Satisfaction with Life Scale</u>. The SWLS (Diener, Emmons, Larsen, & Griffin, 1985) is a general index of subjective life satisfaction. It is a brief measure that is comprised of five statements that the respondent rates on a scale from 1 = "strongly disagree" to 7 = "strongly agree." A sum total provides a total score ranging from 5 to 35, with higher scores indicating more reported satisfaction with life. Adequate reliability and validity is evidenced by an internal consistency value of r = .87, test-retest reliability over a 2-month period of r = . 82, and signficant correlations with measures of subjective well-being (Deiner, Emmons, Larsen, & Griffin, 1985).

Procedure

Body weight measurements were obtained from all participants at Months 0, 3, and 6 using a balance beam scale. At Months 0 and 6 only, the following measures were obtained from all participants: (a) energy intake and nutrient distribution based on a 3-day, self-report food record; (b)

physical activity level derived from a 3-day activity record; 0(c) general quality of life assessed by the Sickness Impact Profile, Beck Depression Inventory, Satisfaction Rating Scales, Satisfaction with Life Scale, and the Perceived Stress Scales; (d) general medical information; (e) Nutrition and Exercise Knowledge Questionnaire. General demographic information and body height were obtained at Month 0 only.

Body height and weight were measured by clinical psychology graduate students who were supervised by a licensed clinical psychologist.

Block randomization to condition was conducted according to diabetes status and gender, because fewer men and fewer subjects with diabetes were expected to participate in the study. Subjects were randomly assigned to one of three conditions: a) weight-loss education condition (14 women; 5 men; 3 individuals with diabetes; M = 216.39 lbs, SD = 32.09); b) standard behavioral treatment (32 women, 11 men, 8 individuals with diabetes; M = 216.95 lbs, SD = 37.75); or c) mastery-based behavioral treatment (34 women, 12 men, 10 individuals with diabetes; M = 207.28 lbs, SD = 32.52). Each treatment condition was divided into 4 groups (with 12-15 subjects each) and therapists were counterbalanced so that no one conducted two groups within the same condition. In addition, lead therapists conducted one group from each condition.

Weight-Loss Education Condition. Subjects in the Weight-Loss Education Condition received minimal intervention during the first six months. Intervention involved a group meeting consisting of a 30- to 45-minute lecture and handouts provided by a doctoral student or faculty member from the Department of Clinical and Health Psychology and the Department of Human Nutrition and Food Sciences. Topics included information on nutrition and diet, based on recommendations from the National Research Council (1989); behavioral modification strategies utilized in standard behavioral weight loss programs (See Perri, Nezu, & Viegener, 1992); and guidelines for exercise, based on recommendations by the American College of Sports Medicine (1991). The information provided was consistent with material presented in lesson plans for the standard behavioral and mastery-based treatment conditions and thereby controlled for education on appropriate ways to manage diet, exercise, and weight. Subjects in this condition attended six meetings over the six month period. After the first six months of the study elapsed, subjects in the weight-loss education condition were offered the opportunity to participate in a standard behavioral weight loss intervention. Subjects in this group received $15 for completing the assessments at 0, 3, and 6 months (total = $45).

Standard Behavioral Treatment Condition. Subjects in the standard behavioral treatment condition received 26 weekly

treatment sessions. Weekly sessions began with weight measurement and individual meetings between therapists and participants to examine self-monitoring records. This was followed by an educational lecture and group discussion. Group discussions were structured to enhance understanding of materials and strategies, problem-solve any difficulties, and provide social support. Participants received information on self-monitoring, diet, exercise, and behavior modification strategies provided through the lectures and a written manual. Specifically, subjects were instructed in behavior modification strategies for changing their eating habits, including procedures for: slowing the pace of eating, reducing eating cues in the home environment, managing social pressures to eat, planning for special events, and coping with relapses. Information regarding nutrition was also included. The manual predominantly reflects a modification of treatment materials developed by Perri (1992) for use with weight management groups. A list of weekly lesson topics may be found in Appendix B.

Subjects were asked to adhere to an average caloric intake of 1200 calories per day for women and 1500 calories per day for men. Subjects gradually worked toward an exercise goal of walking six days a week, for a minimum total of 180 minutes per week. This goal is consistent with recommendations by the American College of Sports Medicine (1991). Subjects also were asked to target a maximal total

fat intake of 30% per day, including a maximum of 10% saturated fat intake per day, in accordance with guidelines from the National Cholesterol Education Program (National Cholesterol Education Program Expert Panel, 1988).

Contingency contracts were established with subjects in the standard behavioral treatment condition prior to initiation of treatment. Contracts specified that participants would be rewarded 1 dollar for attendance and 1 dollar for presentation of complete food records at each weekly treatment session (excluding the first session), for a possible total of 50 dollars.

Additional noncontingent reinforcement was provided through a lottery for prizes that was held during the course of treatment. Subjects were informed that the lottery was to be provided to add incentive for involvement in the program. Each subject in this condition had an equal chance of winning the lottery.

Mastery-based Behavioral Treatment Condition. Treatment for subjects in the mastery-based behavioral treatment condition consisted of the same materials, information, procedures, type of therapists, and length and amount of treatment as the standard behavioral treatment condition described above. The format of each weekly session paralleled the standard treatment condition. However, individual meetings between therapists and participants included the assessment of behavioral skills through a review of eating and

activity records and completion of weekly quizzes. Quizzes evaluated knowledge of nutrition and behavior modification strategies, based on information provided in lectures and the manual. Weekly goals and contingency contracts (i.e., mastery criteria) were established based on these assessments.

Mastery criteria for weight loss, daily calorie intake, physical activity, percentage of fats, self-monitoring, and knowledge of nutrition and behavior strategies were defined for nine levels that successively approximated desired goals for diet, exercise, and knowledge. Criteria for Level 1 were designed to faciliate behavior change easily, with Level 2 though 9 consisting of criteria for mastery that became increasingly more complex. Subjects moved toward these goals at individual rates, based upon skill competence and performance. During the individual meeting at the beginning of the weekly treatment session, participants' skills were assessed according to their diet and exercise logs. When all mastery criteria within a given level were met, the participant was instructed to progress to the next level within the program.

Charts of the criteria for each behavioral skill for each of the nine levels for women and for men are presented in Appendices C and D, respectively. The categories selected--weight loss, reduced caloric intake, increased physical activity, lowered fat intake, knowledge, and self-monitoring--reflect behavioral skills important for

weight management in prior research. Epstein et al. (1994) used weight loss, daily calorie intake, physical activity, and self-monitoring as mastery criteria in his study with obese children and their overweight parents. Ultimate goals for calorie intake, fat intake, and exercise were the same as in the standard condition, but subjects worked toward them in increments defined by mastery criteria, as described in Appendices C and D. A minimum number of days on which mastery criteria for calories, fat, and exercise must be met is included in order to reduce variability in the performance of health behaviors.

Mastery criteria for caloric intake consisted of a maximum average daily intake and the minimum number of days on which the goal must be met. For example, in Level 3, criteria for women specified that the daily caloric intake must be no more than 1400 calories on at least 6 days. The final calorie goal, specified in Level 9, is a maximal intake of 1200 calories every day of the week. Activity goals changed across levels in both the amount of minutes per week and the minimum number of days per week during which exercise must be conducted, beginning with no exercise and ending with the goal of 30 minutes per day, six days per week (total = 180 minutes/week). The final goal for total fat intake was to reduce the percentage of daily fat intake to an maximal total of 30 percent total fat (or 3 fat exchanges according to

food-exchange lists, American Diabetes Association, 1986) on 6 out of 7 days/week.

Weekly quizzes based on information provided in the written lessons and lectures were given to assess mastery criteria for knowledge about nutrition and behavior modification strategies. Information on the quizzes was cumulative, with questions retained from earlier tests combined with new information. Knowledge criteria required correctly responding to an increasing percentage of questions across levels, starting at 60% and ending at 90%.

Mastery criteria for weight loss targeted an ultimate goal of a 14% loss of initial body weight. For the average person entering the study, this would approximate a loss of 28 pounds. Weight loss criteria were defined by percentage body weight reduction. Mastery criteria also specified that participants must continue to self-monitor diet and exercise behavior 7 days per week throughout the study. To shape subjects toward more specific monitoring, new elements to record, such as exercise and fat intake, were added at some levels.

Prior to working on each new level of mastery criteria, contracts were established with each subject for determining the contingent reinforcements to be received upon successful completion of each level of the program. Subjects in the mastery-based condition were monetarily reinforced 5 dollars each time a level was successfully completed, for a possible

total of 45 dollars. In addition, subjects also had the opportunity to participate in the lottery for prizes that was conducted during treatment. Mastery subjects received one lottery ticket for each level of mastery criteria completed, thus allowing them to increase their chances of winning in the lottery that was conducted during treatment.

Medical Concerns. To minimize the risk of medical complications during the treatment study, all participants with diabetes were informed about symptoms of hypoglycemia and cardiorespiratory problems that they might experience during participation in the program, particularly during exercise. Participants were instructed to contact their physician if they were experiencing any of the symptoms described. In addition, precautionary measures recommended by the American College of Sports Medicine (1991) for individuals with diabetes who exercise, such as conducting proper footcare and closely monitoring the effect of exercise on blood glucose levels, were emphasized.

Weight-Loss Therapists. Therapists for both treatment conditions were Clinical and Health Psychology graduate students from the University of Florida. Therapists were supervised on a weekly basis by a licensed clinical psychologist and were trained in specific skills, such as behavioral strategies and nutritional information, used for weight-loss interventions. In addition, therapists were trained in appropriate assessment skills pertaining to the

study, such as accurate weight measurement and calculation of caloric intake and fat percentages in diet.

A licensed dietician served as a consultant for the program throughout the 6 months. In addition, two graduate students from the Department of Human Nutrition and Food Sciences, supervised by the licensed dietician, served as co-leaders for the treatment groups. Their responsibilities included teaching the lessons pertaining to nutrition, reviewing food records, and providing consultation on nutrition-related issues.

CHAPTER III

RESULTS

Data Analytic Strategy

Repeated measures multivariate analyses of variance procedures (MANOVAs) were used to analyze differences between conditions in changes in the dependent variables over time. Specifically, MANOVA procedures were applied to evaluate the effects of the mastery-based intervention on performance of specified self-management skills, weight loss, and quality of life relative to the weight-loss education group, as well as differences in treatment effects between the mastery-based condition and the standard behavioral treatment condition. Treatment condition was used as a between-group factor and time (Months 0, 3, and 6) was used as a repeated measure. MANOVA procedures were used for all repeated measure analyses because of the lesser risk of a Type I error as compared to repeated measure ANOVA models (O'Brien & Kaiser, 1985). Significant MANOVA effects were evaluated further with analysis of variance procedures (ANOVAs) and Student-Newman-Keuls tests. MANOVA and ANOVA procedures were found to yield the same results when examining differences between conditions on variables that did not involve a time factor. Therefore, ANOVA procedures were used when comparing

groups on variables at a single time period (e.g., initial body weight). Correlational analyses were used to evaluate the strength of association between variables. Finally, Chi-Square tests were used to examine differences between the two treatment conditions in the proportion of individuals who benefitted from treatment, according to differences in the dependent variables.

Preliminary Analyses and Attrition

ANOVA procedures indicated that there were no significant pretreatment differences between conditions on initial body weight (ANOVA F (2,103) = .91, p = .41), percentage overweight (ANOVA F (2,103) = .58, p = .56), or body mass index (ANOVA F (2,103) = .68, p = .51). Of the 106 subjects who began the program, 22 dropped out during treatment, yielding an attrition rate of 20.8%. Subjects who dropped out did not differ significantly at pretreatment from subjects who completed the program in initial body weight (ANOVA F (1,104) = 2.32, p = .13), percentage overweight (ANOVA F (1,104) = .13, p = .72), or BMI (ANOVA F (1,104) = .14, p = .71). Drop-outs also did not differ significantly in initial self-reported levels of depression or stress, as indicated by the Beck Depression Inventory (ANOVA F (1,101) = .10, p = .76) and the Perceived Stress Scales (ANOVA F (1,101) = 1.17, p = .28), compared to active participants. The number of drop-outs was not statistically associated with treatment condition (X^2 = 3.44, df = 2, p > .10). Although not

statistically significant, there was a trend toward a higher drop-out rate in the mastery-based condition (28.9%) compared to the standard behavioral condition (16.7%) and the weight-loss education condition (10.5%).

Analyses of Adherence-Related Measures

Table 1 presents means and standard deviations for the four primary adherence variables at pre- and posttreatment, Weeks 1 and 26, respectively: daily average calorie consumption, daily average calories from fat, average weekly exercise, and amount of knowledge about weight-loss strategies (i.e., nutrition, exercise, and behavior change strategies) for the mastery-based, standard behavioral, and weight-loss education conditions. Both calorie and fat data were based on computer nutritional analysis of self-report food records. Exercise data were based on self-report information that was not obtained from the weight-loss education condition.

Analyses of self-report food records using repeated measures MANOVA procedures indicated that both the mastery-based and the standard behavioral treatment conditions significantly decreased caloric intake over time [MANOVA $F(1,55) = 14.4$, $p = .0001$], with no significant interaction effect for condition over time [MANOVA $F(2,53) = .07$, $p = .80$]. Results of a repeated measures MANOVA of average daily caloric intake based on computer analyses of food records for the three conditions indicated (a) a significant main effect for condition, MANOVA $F(2,65) = 7.3$, $p = .001$; (b) a

Table 1
Means and Standard Deviations of Adherence Variables at Pre- and Posttreatment for the Mastery-based, Standard Behavioral, and Weight-loss Education Conditions

Variable	MASTERY M	MASTERY (SD)	STANDARD M	STANDARD (SD)	EDUCATION M	EDUCATION (SD)
Total Calories						
Pre-Tx	1989.8	$(658.7)_{x,X}$	2233.7	$(595.4)_{x,X}$	2269.5	$(610.4)_{x,X}$
Post-Tx	1314.1	$(415.4)_{x,Y}$	1720.0	$(573.3)_{x,Y}$	2301.1	$(974.6)_{y,X}$
Calories From Fat						
Pre-Tx	653.4	$(260)_{x,X}$	705.6	$(292)_{x,X}$	807.3	$(281)_{x,X}$
Post-Tx	370.8	$(140)_{x,Y}$	485.1	$(195)_{x,Y}$	869.4	$(413)_{y,X}$
Calories From Saturated Fats						
Pre-Tx	240.3	$(101)_{x,X}$	253.8	$(125)_{x,X}$	306.9	$(141)_{x,X}$
Post-Tx	132.3	$(56)_{x,Y}$	171.9	$(88)_{x,Y}$	324.9	$(173)_{y,X}$
Exercise (minutes)						
Pre-Tx	120.4	$(74.3)_{x,X}$	127.5	$(107.8)_{x,X}$	---------	
Post-Tx	212.5	$(98.6)_{x,Y}$	192.8	$(99.9)_{x,Y}$	---------	
Knowledge						
Pre-Tx	19.5	$(3.0)_{x,X}$	19.7	$(2.5)_{x,X}$	18.5	$(2.3)_{x,X}$
Post-Tx	21.4	$(2.7)_{x,Y}$	22.0	$(2.0)_{x,Y}$	21.0	$(2.1)_{x,Y}$

Note. Dissimilar lower case subscripts indicate significant differences between conditions within a time period, and dissimilar upper case subscripts indicate significant differences within a condition across time periods ($p < .05$).

significant main effect for time, MANOVA $F(1,65) = 17.3$, $p = .0001$; and (c) a significant interaction effect for Condition x Time, MANOVA $F(2,65) = 4.6$, $p = .01$. Subsequent one-way analysis of variance and Newman-Keuls post hoc comparisons indicated that both the mastery and the standard conditions demonstrated a significantly greater reduction in caloric intake compared to the weight-loss education condition from pre- to posttreatment, but did not differ significantly from one another (ANOVA $F(2,65) = 4.6$, $p < .05$). In addition, there were no significant differences in daily caloric intake between the mastery and standard conditions during any month of treatment (ps $> .10$). Figure 1 illustrates changes in average daily caloric intake over time for the mastery and standard conditions.

Results of a repeated measures MANOVA of average daily fat intake based on computer analyses of food records for the three conditions indicated (a) a significant main effect for condition, MANOVA $F(2,63) = 13.5$, $p = .0001$; (b) a significant main effect for time, MANOVA $F(1,63) = 11.8$, $p = .001$; and (c) a significant interaction effect for Condition x Time, MANOVA $F(2,63) = 6.2$, $p = .004$. Subsequent one-way analysis of variance and Newman-Keuls post hoc comparisons indicated that both the mastery and standard conditions demonstrated significantly greater reductions in total fat intake over time than the weight-loss education condition (ANOVA $F(2,65) = 6.2$,

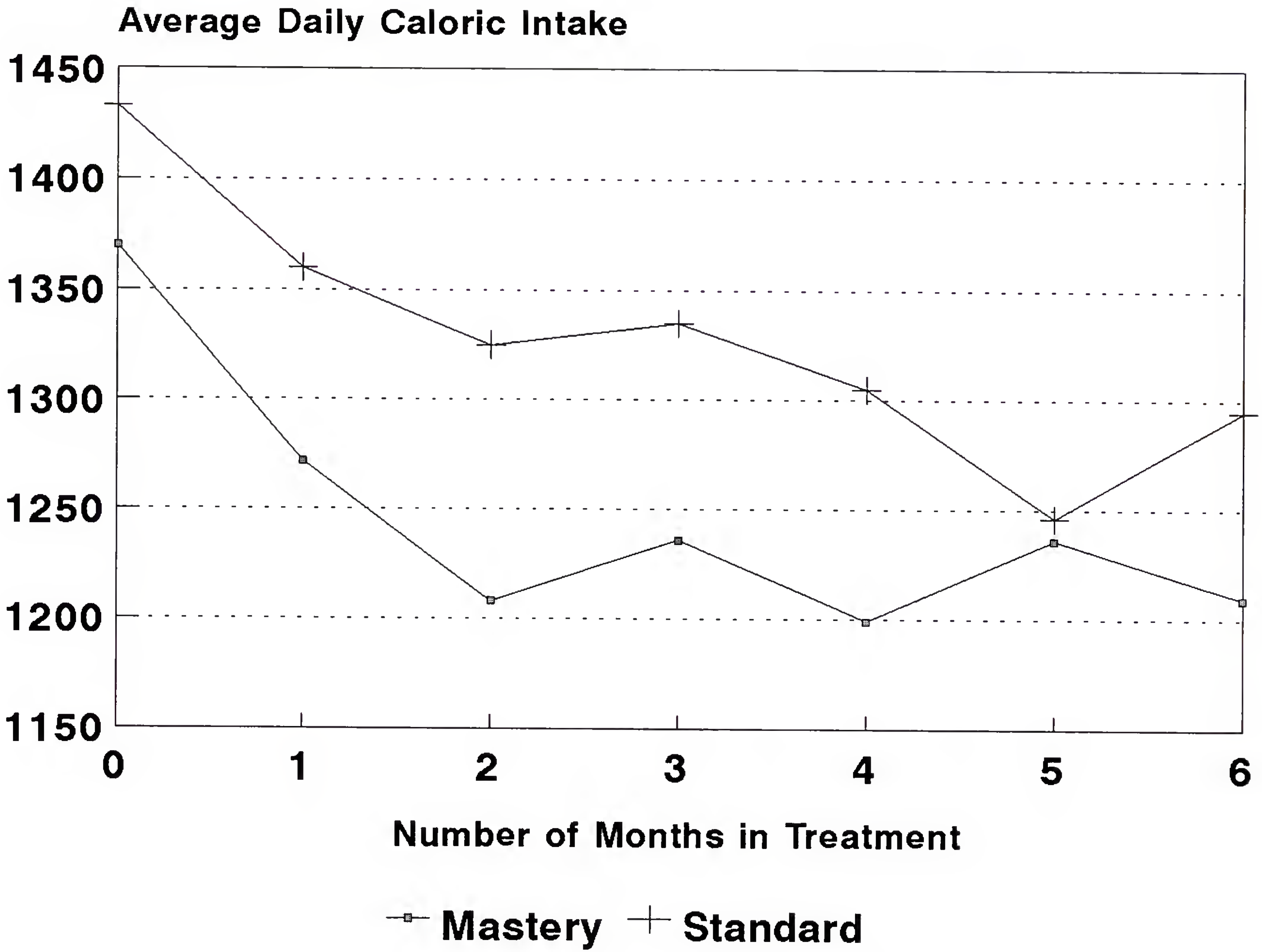


Figure 1
Changes in Average Daily Caloric Intake Over Time

$p = .004$), but no significant differences were observed between the two behavioral treatment conditions ($p > .05$).

Figure 2 demonstrates changes in physical activity over time for the standard and mastery-based conditions. MANOVA procedures used to analyze changes in total weekly exercise yielded a significant main effect for time, MANOVA $F(1,54) = 19.7$, $p = .0001$. No significant main effects were observed for condition (MANOVA $F(1,54) = .04$, $p = .84$) or Condition x Time (MANOVA $F(1,54) = 2.4$, $p = .13$). That is, both the mastery and standard conditions significantly increased the amount of total weekly exercise during treatment, but there was no significant difference between them. Examination of the Physical Activity Record data using MANOVA procedures revealed a significant change in total energy expenditure over time for the three conditions (MANOVA $F(1,70) = 11.57$, $p = .001$), but no difference between them (MANOVA $F(2,70) = 0.05$, $p = .95$).

Subjects in all three conditions showed statistically significant increases in knowledge of weight-loss strategies over time [MANOVA $F(1,75) = 49.9$, $p = .0001$], although actual amount of improvement was small. Specifically, changes in means reflected correctly answering one or two more questions at posttreatment than answered at baseline. No differences between the 3 conditions in changes in knowledge over time were demonstrated [MANOVA $F(2,75) = .28$, $p = .76$].

Additional analyses were conducted to further explore adherence data. Correlational analyses were calculated to

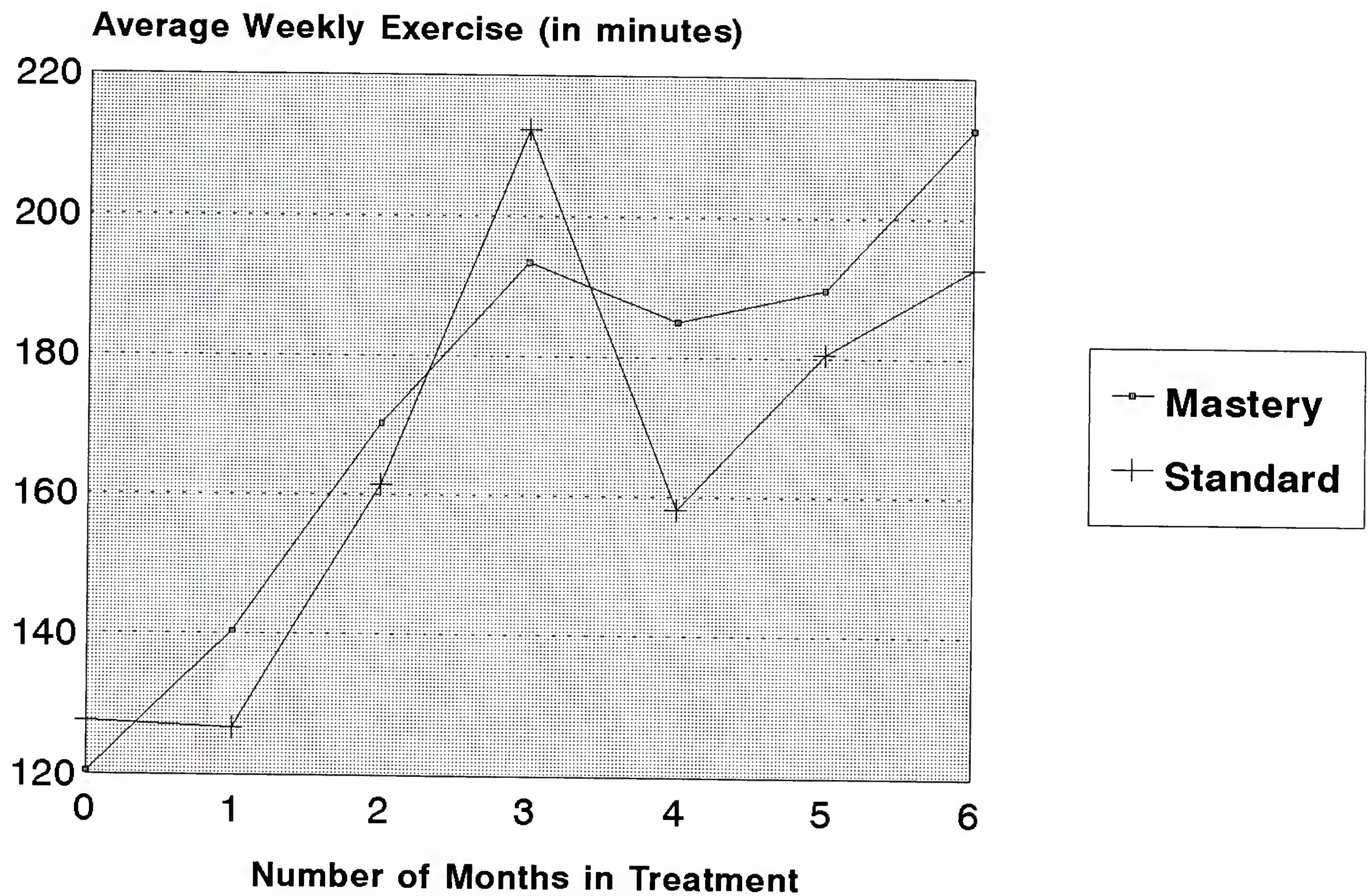


Figure 2
Changes in Physical Activity Over Time

compare the average daily caloric intake derived by subjects and that derived by a computer nutritional database. Self-report measurements of average daily calories based on subject calculation and on computer analysis were found to be significantly positively correlated both at baseline ($r = .44$, $p < .001$) and at posttreatment ($r = .63$, $p < .001$).

Correlational analyses applied to exercise measures indicated that the Physical Activity Record was not correlated with self-report of daily exercise in minutes either at baseline ($r = .01$, $p > .05$) or at posttreatment ($r = -.08$, $p > .05$). One potential reason for the lack of association may be that the two instruments measured different things: the Physical Activity Record assessed total energy expenditure throughout the day and the self-report only measured focused exercise time. However, it is reasonable to assume that total energy expenditure would be boosted by demonstrated increases in amount of exercise. In addition, subjects were observed to be inaccurate in their use of the scale on the Physical Activity Record for estimating the amount of energy expended in a given activity. The validity and utility of the Physical Activity Record, therefore, was questioned.

MANOVA procedures used to examine changes in daily saturated fat intake indicated a) a significant main effect for condition, MANOVA $F(2,63) = 12.1$, $p = .0001$; (b) a significant main effect for time, MANOVA $F(1,63) = 8.7$, $p = .004$; and (c) a significant interaction effect for Condition x Time, MANOVA

$F(2,63) = 4.9$, $p = .01$. Subsequent one-way analysis of variance and Newman-Keuls post hoc comparisons indicated that there were no significant differences in changes in saturated fat intake between the two behavioral treatment approaches. Data also indicated that only the mastery-based behavioral condition demonstrated a significantly greater reduction in saturated fat intake over time compared to the weight-loss education condition ($p < .05$). Examination of the means reveals that the education condition actually demonstrated a marginal increase in saturated fat intake over time.

Analyses of Weight-Related Measures

Table 2 presents means and standard deviations for body weight and body mass index at Months 0, 3, and 6 for each condition. Figure 3 demonstrates the changes in weight over time for the three conditions. Results of a repeated measures MANOVA comparing changes in weight over time indicated (a) no main effect for condition, MANOVA $F(2,81) = 1.6$, $p = .22$; (b) a significant main effect for time, MANOVA $F(2,80) = 68.5$, $p = .0001$; and (c) a significant interaction effect for Condition x Time, MANOVA $F(4,162) = 8.1$, $p = .0001$. Use of repeated measures MANOVAs to analyze changes from pre- to post-treatment in body mass index and percentage overweight, respectively, demonstrated the same pattern of nonsignificant main effects for condition [MANOVA $F(2,81) = 2.31$, $p = .11$; $F(2,81) = 2.01$, $p = .14$], a significant effect for time [MANOVA $F(1,81) = 123.6$, p

Table 2
Means and Standard Deviations of Body Weight and Body Mass Index at Months 0, 3, and 6 for the Mastery-based, Standard Behavioral, and Weight-Loss Education Conditions (in pounds)

	MASTERY	STANDARD	EDUCATION
	M (SD)	M (SD)	M (SD)
BODY WEIGHT			
Month 0	206.1 $(34.0)_{x,X}$	213.9 $(34.7)_{x,X}$	215.6 $(33.6)_{x,X}$
Month 3	193.5 $(34.3)_{x,Y}$	199.5 $(32.3)_{x,Y}$	213.8 $(33.6)_{x,X}$
Month 6	188.7 $(34.7)_{x,Z}$	193.0 $(32.8)_{x,Z}$	211.9 $(33.2)_{y,X}$
BODY MASS INDEX			
Month 0	34.4 $(4.8)_{x,X}$	34.1 $(4.0)_{x,X}$	35.4 $(4.4)_{x,X}$
Month 3	32.3 $(4.7)_{x,Y}$	31.8 $(3.6)_{x,Y}$	35.1 $(4.7)_{y,X}$
Month 6	31.5 $(4.7)_{x,Z}$	30.8 $(3.8)_{x,Z}$	34.8 $(4.5)_{y,X}$

Note. Dissimilar lower case subscripts indicate significant differences between conditions within a time period, and dissimilar upper case subscripts indicate significant differences within a condition across time periods ($p < .05$).

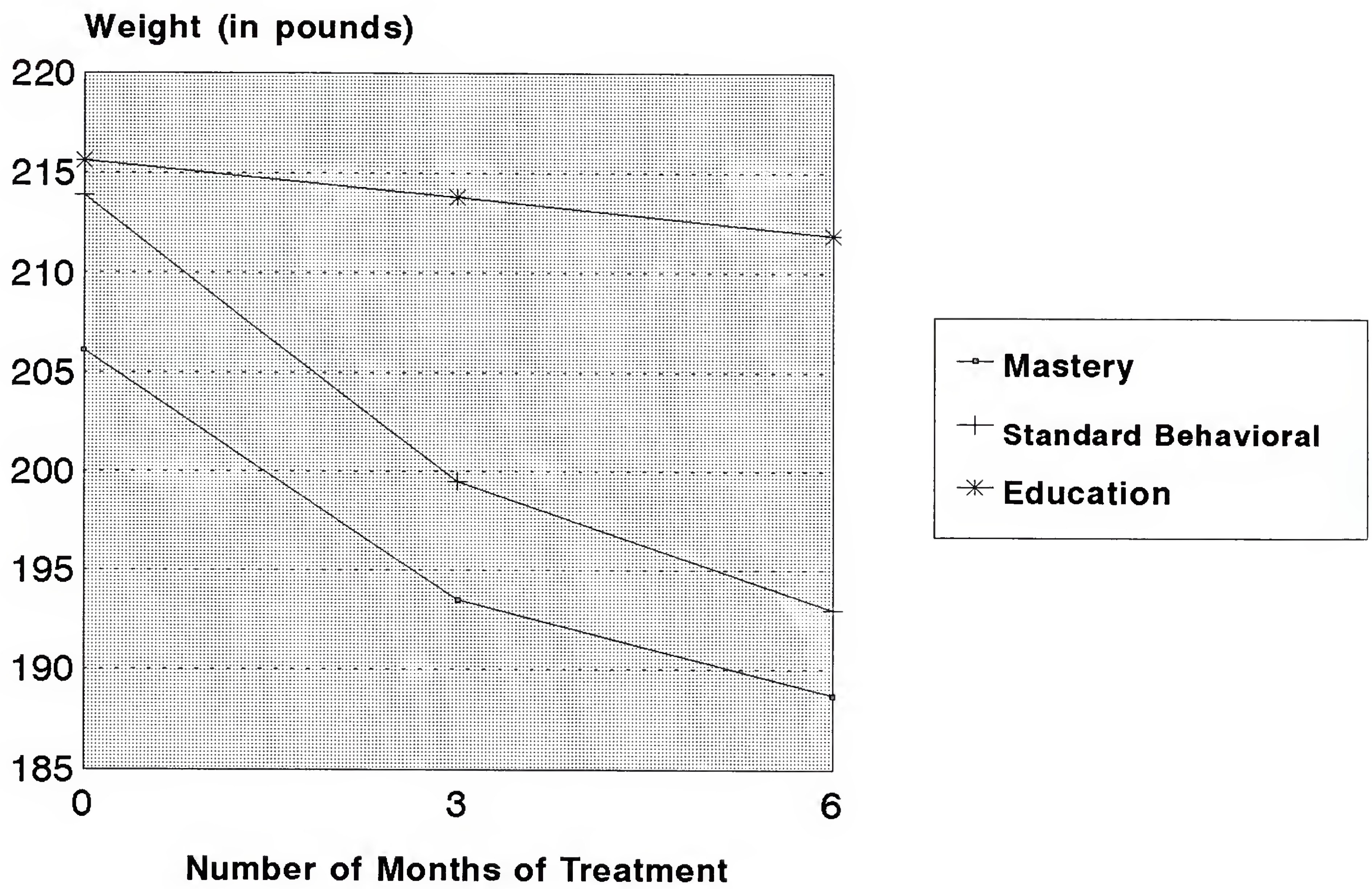


Figure 3
Changes in Weight Over Time for the Three Conditions

= .0001; $F(1,81) = 121.6$, $p = .0001$], and a significant interaction effect of Condition x Time, [MANOVA $F(2,81) = 13.91$, $p = .0001$; $F(2,83) = 14.1$, $p = .0001$].

Analysis of variance and student Newman-Keuls post hoc comparisons were used to examine significant MANOVA effects. Both the standard and the mastery treatment conditions demonstrated significantly greater changes in weight, BMI, and percent overweight over time than the weight-loss education condition at posttreatment ($ps < .05$). No significant difference in weight loss [ANOVA $F(1,65) = 1.56$, $p = .22$], change in BMI [ANOVA $F(1,65) = .70$, $p = .41$], or percent overweight [ANOVA $F(1,65) = .95$, $p = .33$] was demonstrated between the standard and mastery-based treatment conditions.

Additional analyses were conducted to examine the influence of drop-outs, subjects' sex, monetary reinforcement, and therapists on weight-related dependent variables. A repeated measures MANOVA was used to analyze the weight data for all subjects who began the study. To complete missing weight data, the most recent clinical weight obtained from drop-outs was assigned as the posttreatment weight. The same pattern of significant effects were demonstrated as in the analyses that excluded the subjects who dropped out of the study. Specifically, both the mastery and standard conditions made significantly greater changes in weight, BMI, and percent overweight during the course of treatment than the weight-loss education condition ($ps < .05$), but the behavioral treatment

conditions did not differ from one another.

ANOVA procedures indicated a significant difference in initial body weight between males and females [$F(1,65) = 22.7$, $p = .0001$], but not in BMI [$F(1,65) = .07$, $p = .78$] or initial percent overweight [$F(1,65) = 2.0$, $p = .16$]. No difference was demonstrated in weight loss [$F(1,65) = .18$, $p = .67$] between males and females. When controlling for initial body weight, sex differences in changes in weight loss [$F(1,64) = .41$, $p = .52$], BMI [$F(1,64) = 1.9$, $p = .17$] and percent overweight [$F(1,64) = 1.5$, $p = .23$] remained nonsignificant. Results indicated a significant difference in the amount of monetary reinforcement received by subjects within the two treatment conditions [ANOVA $F(1,65) = 18.8$, $p = .0001$], with subjects in the standard treatment group receiving more money ($M = 41.11$ dollars) than subjects in the mastery group ($M = 31.59$ dollars). Although there was a significant correlation between weight loss and monetary reinforcement ($r = .57$, $p < .001$), differences in weight loss between the standard and the mastery conditions remained nonsignificant when monetary reinforcement was co-varied in the ANOVA procedure [$F(1,64) = 1.8$, $p = .18$].

ANOVA procedures were used to explore potential therapist effects by comparing differences on weight variables between nights that subjects received treatment. Significant differences in weight loss [$F(3,63) = 3.92$, $p = .01$] and in changes in BMI [$F(3,63) = 3.24$, $p = .03$] over time were observed between the nights that subjects received treatment, suggesting

a therapist effect on weight loss. One-way analysis of variance and student Newman-Keuls post hoc comparisons were used to examine differences within the four groups of the mastery condition. Results indicated that one group did significantly poorer than the other three groups in the amount of weight and BMI change made during treatment ($ps < .05$). No significant differences were found between groups in the standard condition ($ps > .05$). To eliminate potential therapist effects, weight analyses were calculated excluding the poorest performing mastery group. Analyses demonstrated nonsignificant differences between the treatment conditions for changes in weight [MANOVA $F(1,59) = .17$, $p = .69$], BMI [MANOVA $F(1,59) = .01$, $p = .99$], and percent overweight [MANOVA $F(1,59) = .03$, $p = .87$]. Average weight losses for the two conditions became less discrepant, however, ($M = 19.7$ pounds for Mastery, $M = 20.9$ pounds for Standard) and more consistent with previous behavioral outcome studies.

Chi-square procedures were conducted to compare proportions of mastery and standard subjects who responded to treatment. There was no significant difference between conditions in the proportion of subjects who lost 20 or more pounds ($X^2 = 1.25$, $p > .10$); however, 41% of the mastery subjects lost at least 20 pounds compared to 54% of the subjects in the standard condition.

Analyses of Quality of Life Measures

Table 3 contains mean values for quality of life variables at baseline and at 6-months for the three conditions. ANOVA procedures indicated that, at baseline, the weight-loss education condition evidenced significantly poorer global functioning [ANOVA $F(2,80) = 5.6$, $p = .01$], lower life satisfaction [ANOVA $F(2,80) = 3.6$, $p = .03$], and more depressive symptomatology [ANOVA $F(2,80) = 3.5$, $p = .04$] compared to the two treatment conditions. Analyses conducted subsequent to excluding outliers, defined as those records whose SIP score exceeded 25 ($N = 2$), resulted in no significant differences between conditions at baseline ($ps > .10$). Therefore, subsequent analyses of quality of life variables were conducted without the two records containing outliers. MANOVA and subsequent univariate analyses revealed significant or marginally significant improvements in global functioning, as measured by the Sickness Impact Profile, in all three conditions ($ps > .10$). In addition, there was significant improvement over time in general life satisfaction ($ps < .10$), depression ($ps < .05$), and stress ($ps < .10$) for the mastery and standard conditions. None of the three conditions demonstrated a clinically significant elevation in global functioning or depression at baseline, however. The mastery and standard conditions showed a greater increase in life satisfaction than the weight-loss education condition [ANOVA $F(2,74) = 4.7$, $p = .01$]. The three conditions did not significantly differ in

Table 3
Mean Values of the Quality of Life Variables for the Mastery-based, Standard Behavioral, and Weight-Loss Education Conditions at Pre- and Posttreatment

	MASTERY M (SD)	STANDARD M (SD)	EDUCATION M (SD)
SIP			
Pre-Tx	4.5 (3.8)$_{x,X}$	4.1 (4.5)$_{x,X}$	5.6 (7.6)$_{x,X}$
Post-Tx	0.7 (3.4)$_{x,Y}$	2.6 (3.9)$_{x,X}$	0.8 (5.4)$_{x,Y}$
SATIS			
Pre-Tx	27.0 (5.4)$_{x,X}$	25.7 (4.7)$_{x,X}$	24.0 (7.7)$_{x,X}$
Post-Tx	32.6 (4.5)$_{x,Y}$	29.7 (7.5)$_{x,Y}$	23.8 (8.5)$_{y,X}$
SWLS			
Pre-Tx	23.7 (5.9)$_{x,X}$	20.9 (6.7)$_{x,X}$	20.8 (8.5)$_{x,X}$
Post-Tx	25.9 (6.2)$_{x,X}$	23.5 (7.3)$_{x,Y}$	21.1 (7.9)$_{x,X}$
BDI			
Pre-Tx	7.1 (5.7)$_{x,X}$	8.7 (6.6)$_{x,X}$	8.3 (6.2)$_{x,X}$
Post-Tx	3.3 (3.5)$_{x,Y}$	6.4 (6.5)$_{x,Y}$	8.0 (6.5)$_{x,X}$
PSS			
Pre-Tx	22.3 (8.2)$_{x,X}$	22.7 (8.5)$_{x,X}$	22.5 (8.7)$_{x,X}$
Post-Tx	18.7 (6.9)$_{x,Y}$	20.2 (9.0)$_{x,X}$	23.0 (10.9)$_{x,X}$

Note. SIP = Sickness Impact Profile; SATIS = Satisfaction Rating Scale; SWLS = Satisfaction with Life Scale; BDI = Beck Depression Inventory; PSS = Perceived Stress Scale. Dissimilar lower case subscripts indicate significant differences between conditions within a time period, and dissimilar upper case subscripts indicate significant differences within a condition across time periods ($p < .05$).

changes on any other psychological variables over time ($ps > .05$). Ratings of self-efficacy significantly increased for both the standard and mastery conditions over time [MANOVA $F(1,59) = 22.4$, $p = .001$], but there was no significant difference between them [MANOVA $F(1,59) = .002$, $p = .96$].

Analyses of the Effect of Diabetes Status

ANOVA procedures indicated that the subjects with diabetes were significantly heavier at the onset of treatment than the nondiabetic subjects, as measured by initial body weight [$F(1,104) = 6.3$, $p = .01$]. Therefore, to examine potential differences in weight loss between diabetic and nondiabetic subjects, the 13 subjects with diabetes from the two treatment conditions were matched on gender, initial body weight, initial percentage over ideal weight, and treatment condition with 11 nondiabetic subjects and compared for differences in response to treatment. ANOVAs indicated that there were no significant differences between the two samples in initial body weight [($F(1,22) = .002$, $p = .97$], percentage overweight [F 1,22) = .26, $p = .62$], initial body mass index [$F(1,22) = .68$, $p = .42$], or age [$F(1,22) = .10$, $p = .75$]. Table 4 presents means and standard deviations for weight-related variables for the matched sample of diabetic and nondiabetic subjects at pre- and posttreatment.

MANOVA procedures demonstrated no significant difference in amount of weight loss [$F(1,22) = .210$, $p = .65$], BMI change [F $(1,22) = .02$, $p = .88$] or percent overweight change

Table 4
Means and Standard Deviations for Weight-Related Variables for Diabetic and Nondiabetic Subjects at Pre- and Posttreatment

	NONDIABETICS		DIABETICS	
	M	(SD)	M	(SD)
WEIGHT (lbs)				
Pre-Tx	232.1	$(34.3)_{x,X}$	231.4	$(41.0)_{x,X}$
Post-Tx	210.3	$(30.6)_{x,Y}$	211.9	$(40.7)_{x,Y}$
BODY MASS INDEX				
Pre-Tx	34.6	$(5.0)_{x,X}$	36.2	$(4.8)_{x,X}$
Post-Tx	31.3	$(4.4)_{x,Y}$	33.1	$(4.5)_{x,Y}$
PERCENT OVERWEIGHT				
Pre-Tx	55.1	$(21.1)_{x,X}$	59.5	$(21.9)_{x,X}$
Post-Tx	40.6	$(18.8)_{x,Y}$	45.9	$(21.3)_{x,Y}$

Note. Dissimilar lower case subscripts indicate significant differences between conditions within a time period, and dissimilar upper case subscripts indicate significant differences within a condition across time periods ($p < .05$).

[$F(1,22) = .06$, $p = .82$] for the subjects with diabetes compared to the nondiabetic matched sample. Additional exploratory analyses were conducted to further examine relationships between the two groups on adherence-related and quality of life variables. ANOVA procedures revealed no significant posttreatment differences in caloric intake [$F(1,19) = .14$, $p = .71$] or total fat intake [$F(1,17) = .40$, $p = .54$] between the two groups. Subjects who did not have diabetes, however, demonstrated a marginally greater increase in exercise over time [MANOVA $F(1,18) = 3.4$, $p = .08$]. On quality of life measures, although subjects who did not have diabetes reported significantly more depressive symptoms at baseline (ANOVA $F(1,23) = 12.4$, $p = .002$), symptoms in this group diminished during treatment so that no significant difference between groups was noted at posttreatment (ANOVA $F(1,22) = 2.4$, $p = .14$).

Subjects with Type II diabetes were queried at posttreatment, using a self-report questionnaire, about changes in their diabetes management during the weight loss program. Ninety-two percent (12/13) of the subjects in the two treatment conditions reported an improvement in their diabetes during the weight loss program, with 77 percent (10/13) of these describing positive changes in their medication regimen. Specifically, 1 subject discontinued insulin, 1 decreased the insulin dosage, 5 discontinued oral medications, and 3 decreased oral medication dosages. None of

the three subjects with diabetes in the Weight-loss Education condition reported changes in their diabetes status over time.

Additional Analyses of the Mastery-based Condition

Figure 4 presents percentages of the number of individuals at each mastery level at Months 3 and 6. The mean mastery level completed at the end of the 6-months was 7, with a mode (31.3%) at Level 5. Only three subjects reached Level 10, the highest level obtainable. To explore potential discriminating factors between subjects who excelled in the mastery condition and those who did not perform as well, ANOVA procedures were used to compare the subjects within the mastery condition who reached Mastery Level 8 or higher to those who reached Level 7 or lower. Results indicated that subjects did not differ on initial weight variables, demographic variables (age, education, and gender), or diabetes status (ps > .10). On adherence variables, subjects who reached higher mastery levels reported significantly more cumulative minutes of exercise (ANOVA $F(1,22) = 4.3$, $p = .05$) and better attendance (ANOVA $F(1,22) = 24.3$, $p = .0001$) over time compared to those who reached Level 7 or lower. There was not a significant difference in cumulative caloric intake over time between the two groups (ANOVA $F(1,22) = .17$, $p = .68$).

Given that progress through the mastery levels is sequential and cumulative (that is, a cross-sectional look at a subjects' adherence at a particular level reflects adherence

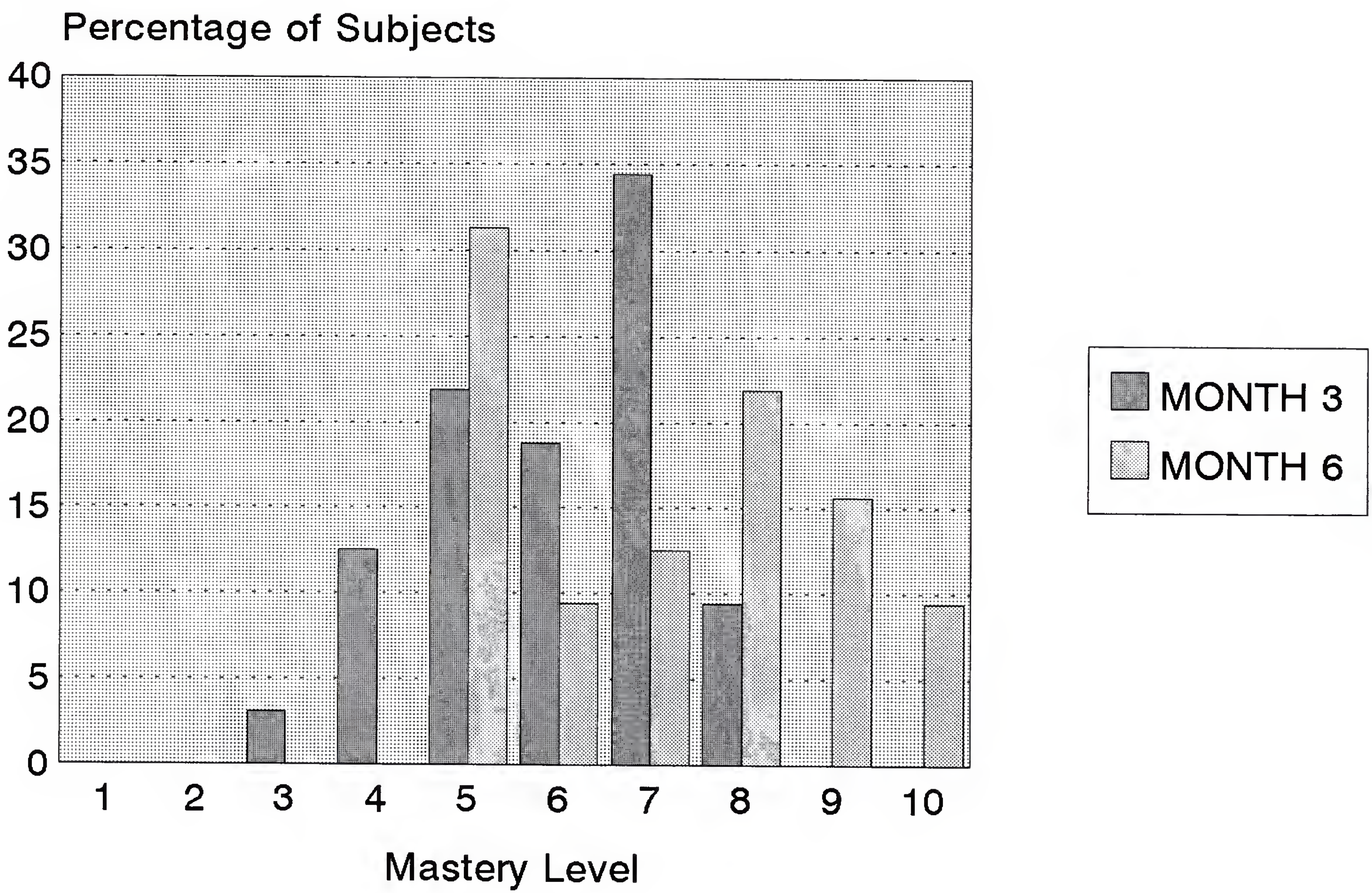


Figure 4
Percentage of Subjects at Each Mastery Level

to criteria and progress through all preceeding levels), comparisons between the mastery and standard conditions on mastery criteria at a particular point in time will not provide a fully accurate picture of possible differences between them. However, an examination of differences in the proportions of subjects within each condition that achieved the calorie and exercise goals for a particular level at a given time can suggest variability in adherence to skills between the two conditions. Chi-square analyses were conducted to examine discrepancies in the number of subjects who adhered to mastery criteria for exercise and caloric intake for Level 7 (the mode at month 3 and mean at month 6) at months 3 and 6. Results indicated that a marginally greater proportion of female mastery subjects averaged fewer than or equal to 1200 calories per day compared to standard condition subjects at month 3 ($\underline{X}^2 = 3.18$, $\underline{p} = .07$), but not at month 6 ($\underline{X}^2 = .16$, $\underline{p} = .69$). There was no difference demonstrated in the proportion of male mastery subjects who averaged fewer than or equal to 1500 calories per day compared to the standard male subjects at month 3 ($\underline{X}^2 = 1.2$, $\underline{p} = .28$), but mastery subjects averaged marginally fewer calories at month 6 ($\underline{X}^2 = 2.9$, $\underline{p} = .09$). There were also no differences in those exercising at least 180 minutes per week at month 3 ($\underline{X}^2 = .02$, $\underline{p} = .89$) or month 6 ($\underline{X}^2 = .83$, $\underline{p} = .36$).

Univariate analyses indicated that subject satisfaction ratings with treatment and therapists at posttreatment were

slightly higher for the mastery condition compared to standard treatment (t = 1.9, df = 6, p < .10). Neither subjects' expectancies about treatment nor satisfaction ratings with the program were correlated with weight loss (Expectancy: r = .08, p > .05; Satisfaction: r = -.08, p > .05).

CHAPTER IV

DISCUSSION

The primary objective of this study was to determine if adding mastery criteria to a behavioral weight loss program would enhance response to treatment. Results indicated that individuals in the two behavioral treatment conditions lost an average of 20.3 pounds over the initial six month period, which is consistent with the literature on outcomes in behavioral treatment programs (Brownell & Wadden, 1992). Individuals in both behavioral conditions also demonstrated significant reductions in total caloric and fat intake, increases in exercise, increases in general life satisfaction, and reductions in stress. Although both behavioral interventions produced significant positive responses in terms of adherence to self-management skills, amount of weight lost, and quality of life, the mastery approach did not differ significantly from the standard behavioral approach in effectiveness.

Based on theoretical and empirical data, hypotheses had predicted that the addition of mastery criteria would enhance effects of a behavioral weight loss intervention by facilitating the acquisition of self-management skills necessary for effecting changes in lifestyle and,

consequently, in weight. In addition, the mastery approach entailed pacing goals and reinforcement according to individual rates of progress, thereby creating a more individualized approach within a group setting.

Both the effectiveness of the behavioral interventions and the inability of the mastery approach to improve outcome can be understood according to the conceptual model of health behavior change proposed for this project. The model postulated that manipulation of certain mediating variables, such as skills and knowledge, would affect the likelihood of producing changes in eating and exercise behaviors that would yield desired biological (e.g., weight loss) and behavioral outcomes (e.g., quality of life). Both the standard and mastery-based interventions targeted teaching skills and knowledge and successfully produced changes in eating and exercise behaviors. As predicted by the model, changes in these health behaviors yielded the desired biological and behavioral outcomes. The inability of the mastery approach to improve outcome over standard treatment suggests that there was no significant difference in the ability of the two interventions to manipulate the variables responsible for effecting behavior change. That is, it appears that the mastery-based approach was not better than the standard treatment in manipulating factors that lead to changes in weight-related behaviors.

Several factors may have contributed to the inability of the mastery criteria to bolster initial treatment effects. First, although the purpose of breaking down end goals for diet and exercise into smaller increments in the mastery condition was to facilitate acquisition of skills at an individual rate, the result was that subjects in the mastery condition were monetarily reinforced for their skill mastery on an intermittent schedule and subjects in the standard condition were reinforced for their attendance and homework completion on a continuous schedule (i.e., each week). As a result, subjects in the standard condition, regardless of performance, were reinforced for attending meetings while subjects in the mastery-based condition often went weeks of attending meetings without receiving monetary reinforcement. In addition, subjects in the standard condition ultimately received significantly more monetary reinforcement than the mastery condition. Thus, mastery subjects did not receive as consistent, or as frequent, or as much, of a monetary reinforcement during treatment. Qualitative observations by therapists indicated that the result of this difference was that mastery subjects experienced disappointment and frustration when they could not achieve mastery levels, expressed concerns about getting their money back, and had less incentive to attend meetings when they were not doing well because they would not be reinforced for coming.

That the modal mastery level achieved at posttreatment was Level 5, only midway to the highest level, indicates that the levels were too difficult to foster consistent, frequent progression. In particular, clinical observation indicated that the mastery criteria for weight loss was frequently the "skill" that subjects were unable to achieve and, thus, prevented them from passing to the next level. This was particularly problematic because, unlike the other skills, weight loss was not a behavior that was under the subjects' direct influence. Weight loss had been included in order to maintain similarity to the original study conducted by Epstein (1994). However, future research should consider limiting skills to those behaviors that the subject can modify directly. Other methods for increasing the frequency of reinforcement, such as by making the mastery levels easier to achieve and by adding other continuous reinforcers, will also be important modifications for future studies and critical for maintenance of changes (Epstein, 1992).

A second factor that may have contributed to the lack of an experimental effect is that, given the consistent finding of an approximate 20 pound weight loss following behavioral interventions, results may reflect a possible ceiling effect. That is, it may be that the maximum initial weight loss (i.e., after 6-months) obtainable with conservative approaches has been reached and can only be enhanced either by introducing more vigorous strategies, such as incorporating the use of

very-low-calorie-diets (VLCDs) in initial treatment, or utilizing techniques that will improve maintenance of new behaviors and initial weight loss after the initial treatment phase. This conclusion suggests a third reason why no added effect of mastery criteria was evidenced. That is, the objective in the mastery approach was to increase adherence of diet and exercise behaviors through enhanced skill acquisition, thereby making it less resistant to extinction. The positive effect of using mastery criteria, therefore, may not emerge until after the initial treatment phase, when maintenance of behaviors and weight loss are critical. Comparison of the two behavioral conditions at one year will provide evaluation of this hypothesis.

These results differed from those of Epstein et al. (1994), who found that the addition of mastery criteria significantly improved treatment outcome compared to a standard behavioral treatment condition. Several factors may account for the differences in results. First, the former study was a family-based treatment for obese children with a sample that consisted of children and their parents, sixty-one percent of whom were also overweight. Parenting skills were a significant additional component used to reinforce childrens' behaviors and weight loss. In addition, both parent and child had to demonstrate mastery of skills and weight loss to progress to the next level. These differences may have produced a differential effect because of the

interaction between technique and context. It may be that the mastery criteria is particularly helpful in enhancing adherence within a family context and not as effective with individual adults. Dissimilarities in reinforcement schedules between the two studies may also have contributed to differences. In Epstein's study, subjects in the control group moved through levels yoked to the mastery group and were provided with equal, but noncontingent, reinforcement. As a result, mastery subjects in Epstein's study may have received more frequent reinforcement than mastery subjects in the present study and may have more closely approximated the amount of reinforcement received in its control group. Finally, it has been hypothesized that the mastery condition in the present study may demonstrate better maintenance than the standard condition at follow-up, which would be consistent with follow-up data from the Epstein study. Therefore, it may be that, over time, data from the present study will become more consistent with results from earlier research.

Although results did not support the primary hypothesis that the mastery-based approach would enhance adherence of self-management skills, subjects in both of the behavioral treatment conditions significantly reduced caloric intake over time. In addition, further analysis revealed that both behavioral conditions demonstrated significant reductions in total fat and saturated fat during the program. Average daily total fat intake was reduced from 75.5 grams to 47.6 grams for

the behavioral treatment conditions. The weight-loss education condition did not reduce caloric intake or demonstrate positive changes in diet composition.

Computer analyses of diet composition using a nutrient database such as utilized in this study represents a critical addition to the evaluation of obesity treatment outcomes. The nutritional analyses allowed for evaluation of specific targeted changes in diet composition, including reductions in fat and saturated fat, in addition to general reductions in caloric intake. The importance of specific changes in diet--particularly in reducing fat--for improving health status as well as effecting weight loss has been well documented in research (Robinson et al., 1993; Willett, Stampfer, Colditz, Rosner, Hennekens, & Speizer, 1987). Reduction in fat is routinely targeted in weight-loss interventions but infrequently measured systematically in outcome. Because of the importance of diet composition both for producing weight loss and improving health status, use of nutritional analyses in evaluating behavioral treatment outcomes should be continued.

The fact that subjects statistically, but not clinically, increased their knowledge of nutrition is likely attributable to the general information surveyed on the test. Average scores across conditions were high at baseline, leaving little room for improvement. These data suggest that most individuals had general knowledge about eating management

when entering the program, but needed intervention to be able to effectively apply their knowledge. This is consistent with the literature indicating that knowledge is necessary but not adequate for facilitating behavior change. In addition, it may be that the instrument was not sophisticated enough to measure important changes in diet-related information over time.

When data were examined to further evaluate differential responses to treatment on weight-related variables, it was observed that the proportion of individuals who successfully lost weight did not differ between the standard and mastery approaches. In addition, contrary to prior research (e.g., Kramer, Jeffery, Forster, & Snell, 1989; Wing, 1992), the current study did not find gender effects in response to treatment. Men and women demonstrated equivalent changes on weight-related variables, when initial weight was controlled for.

The self-reports in increases in life satisfaction and reductions in depressive symptoms and perceived stress indicate that the behavioral interventions positively affected quality of life in participants. These positive changes in mood are consistent with the literature (Wing et al., 1984). It is notable that average scores for the conditions indicated that subjects did not evidence clinical elevations in global functioning or depression at baseline. The lack of change between the treatment conditions on psychological variables,

therefore, is likely attributable to a floor effect, in that participants did not evidence significant psychological distress initially. The increase in self-efficacy experienced by subjects in both the standard and mastery conditions indicated that the behavioral treatments were effective in boosting individuals' belief in their ability to perform the behaviors necessary for weight loss. Given that self-efficacy is an important factor in effecting behavior change (Bandura, 1989; Ewart, 1989), these data provide further indication of treatment effectiveness.

A secondary goal of this research was to examine the efficacy of a minimal treatment intervention compared to the behavioral treatment programs. Results indicated that the mastery-based and standard approaches were more effective than weight-loss education alone in producing positive changes in weight-related variables, increasing adherence to diet and exercise goals, and increasing general life satisfaction. Minimal treatment studies have typically compared results to 10-week behavioral treatment programs and found no significant differences in efficacy (Black & Threlfall, 1986; Marston, Marston, & Ross, 1977). The current study, however, indicated that a minimal intervention that provided basic information on diet, exercise, and behavior strategies performed significantly poorer than behavioral treatment programs. Subjects in the weight-loss education condition lost an average of only 3.7 pounds, and--unlike the behavioral

interventions--subjects in the education condition did not reduce caloric or fat intake and did not increase life satisfaction or reduce stress over time. It is likely that previous studies did not demonstrate differences between minimal interventions and behavioral programs in weight loss because treatment was not long enough to produce the effects found in standard behavioral treatments.

Subjects in the weight-loss education condition demonstrated significantly higher levels of psychological distress than the two behavioral conditions. One possible explanation is that baseline measures of psychological functioning were assessed after randomization to conditions. Therefore, the subjects knew at the time of the baseline assessment whether or not they would be receiving treatment immediately or in six months, and this may have contributed to higher or lower scores on self-report measures of distress. However, removal of two outliers from this condition resulted in nonsignificant differences in baseline psychological measures between the three conditions.

Special effort was made to recruit subjects with Type II diabetes for the project because of the additional health benefit of weight loss for this population. Comparison of outcome for diabetic and nondiabetic subjects indicated that diabetes status did not have an effect on response to the weight loss treatment. Specifically, individuals with diabetes were equivalent to a matched subsample of nondiabetic

subjects in changes in weight, body mass, and percentage over ideal body weight. These results contradict two prior studies of the effect of diabetes status on weight that had suggested that individuals with diabetes lose less weight than nondiabetic individuals (Henry et al., 1985; Wing et al., 1987). In addition, contrary to findings of the Wing et al. study (1987), results from the current study revealed no significant differences in reductions in caloric intake between the two groups. Subjects who did not have diabetes, however, did demonstrate a marginally greater increase in exercise over time. Although subjects who did not have diabetes reported experiencing more depressive symptoms at baseline than subjects with diabetes, symptoms diminished during treatment so that no significant difference between groups was noted at posttreatment. Finally, although laboratory studies of metabolic control were not obtained, subjects' reports suggested positive changes in diabetes management during treatment. Specifically, all but one subject diagnosed with Type II diabetes from the two behavioral treatment conditions reported an improvement in diabetes management at the end of the initial treatment phase, with the majority reporting beneficial changes in medications, including five who discontinued medications altogether.

One possible explanation for discrepancies between these data and that of Wing et al. (1987) is that the latter used nonindependent spouse pairs, which may have produced a

reactivity effect. For example, spouse pairs in a weight loss program may provide support or competition to one another that might influence adherence and outcome, thereby confounding potential reasons for differences between the diabetic and nondiabetic groups. The present study made some important improvements in this area by using independent pairs who were matched on age, initial weight variables, and gender. When independent pairs were compared, no differences in weight loss were found.

Another possible reason for the discrepancies in results may be attributable to varying distributions of medication use among subjects between the different studies. For example, the current study had fewer subjects taking insulin and more subjects taking oral medications compared to the Wing study (1987). Studies have yielded conflicting results about the effect of diabetes medications on weight loss (Harris, Davidson, & Bush, 1988; University Group Diabetes Project, 1971; Wing, Shoemaker, Marcus, McDermott, & Gooding, 1990); thus, this remains an important potential confound to explore when examining the effect of diabetes status in future studies.

Finally, although these data suggest that individuals with diabetes can demonstrate results equal to nondiabetic individuals in a behavioral weight loss intervention, the small sample size used in this study hinders making definitive conclusions about the effect of diabetes status on treatment

outcome at this time. This remains an important finding to replicate with a larger sample size, particularly because of the implications for treatment planning.

The present study yielded results consistent with the obesity treatment literature, but did not demonstrate increased efficacy with the addition of mastery criteria to a standard behavioral intervention. Although quantitative data did not demonstrate advantages in using mastery criteria, qualitative observations highlighted some benefits. According to therapists who led the weight loss groups, advantages of the mastery approach over the standard intervention were that it provided helpful means for breaking down long-term goals into smaller increments, delineated more specific goals, and worked well for those who were competitive. In addition, satisfaction ratings with treatment were slightly higher for subjects in the mastery condition.

Results from the present study have implications for future work in the area of obesity treatment, both clinically and empirically. Data indicate that the addition of mastery criteria alone is not sufficient to enhance treatment outcome. Future studies may improve upon the use of mastery criteria by modifying mastery levels to optimize opportunity for advancement and by developing more frequent reinforcement schedules. Additional methods for individualizing interventions and facilitating skill acquisition within a group format are also needed. Some recent research has

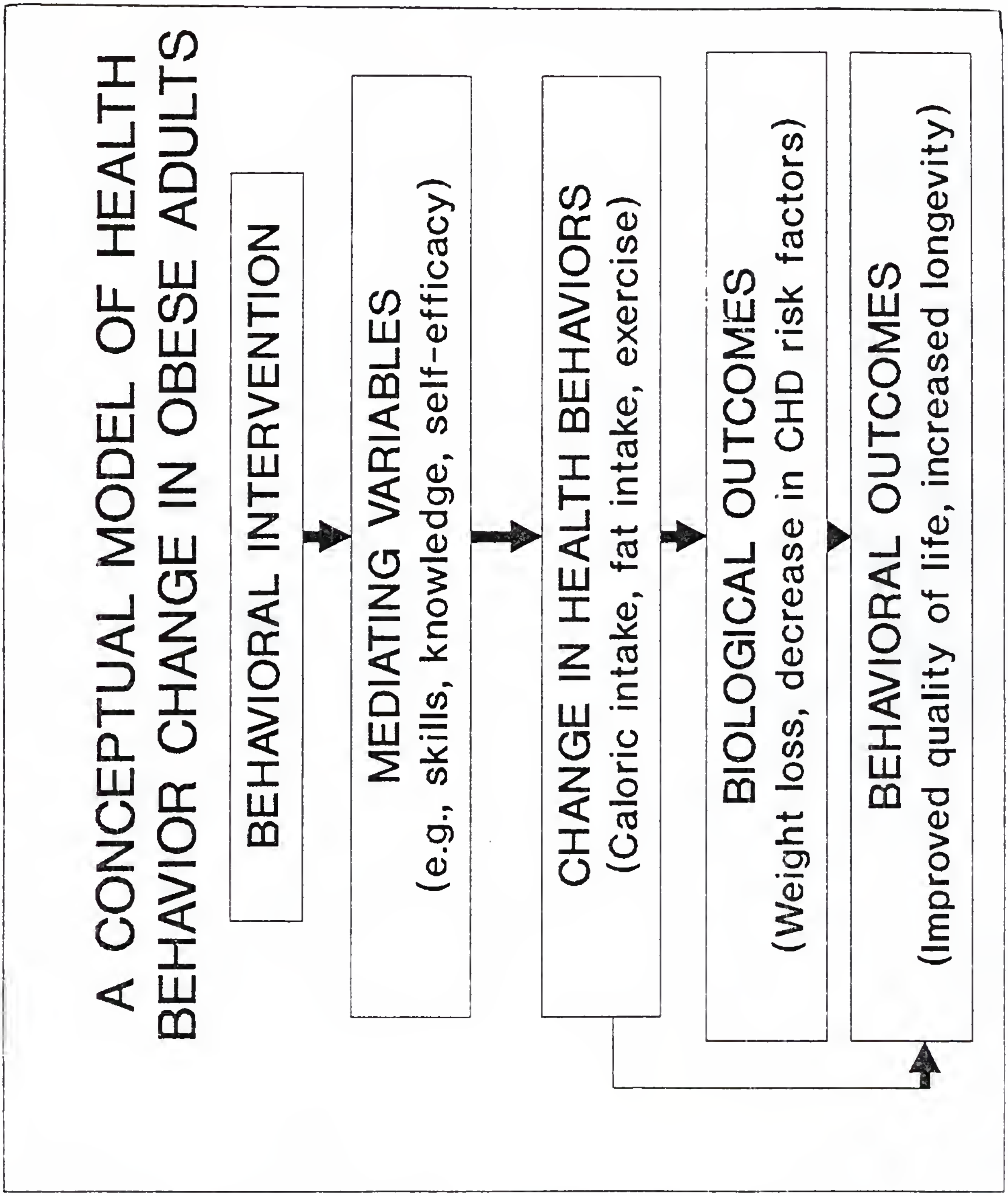
combined different approaches--such as VLCDs and behavioral treatment--to try to improve initial response to intervention. The key question continues to be, however, which approach provides the best <u>long-term</u> results, since methods that produce the best initial results are not always maintained at follow-up (Wadden et al., 1989; Wadden & Stunkard, 1986). Therefore, six-month follow-up data to the present study will provide useful additional information for further evaluating the utility of mastery criteria.

The findings in this study also indicated that individuals with diabetes can accomplish clinically significant weight loss equivalent to that of nondiabetic individuals in a behavioral weight-loss program. Replication of these findings with a larger sample that controls for medication regimen will be an important expansion of the current research, and necessary for elucidating the effect of diabetes status on treatment response. Finally, although data from the current study indicated that education is not sufficient to produce significant weight loss or behavior change, the search for better time and cost effective approaches to obesity treatment should remain an essential part of research objectives. The escalating cost of health care and rapid changes in health care delivery highlight the need to determine the minimal intervention necessary to produce clinically significant weight loss. This will

continue to be a critical factor in the development and evaluation of obesity treatment interventions in the future.

APPENDIX A

CONCEPTUAL MODEL OF HEALTH
BEHAVIOR CHANGE IN OBESE ADULTS



APPENDIX B
WEEKLY LESSON TOPICS

1. You and Your Eating
2. Controlling Your Eating
3. Exercise and Weight Loss
4. Making a Personal Decision to Exercise
5. Nutrition: Increasing Your Awareness
6. Balancing Your Diet
7. Using the Exchange Lists
8. Controlling the Factors that Influence Your Eating
9. Making Eating a Pure Experience and Rewarding Yourself
10. Self-reward and Preparing for the Unexpected
11. Chaining and Time-outs
12. Feedback on Computer Nutritional Analyses of Baseline Food Intake
13. Preplanning and Controlling Holiday Eating LOTTERY
14. Asserting Yourself in Social Situation
15. Becoming an Informed Consumer
16. Eating Your Way to a Healthier You
17. Relaxation Training
18. Observing and Developing Positive Thoughts
19. Using Positive Thoughts to Counteract Underlying Assumptions
20. Using Imagery to Help You Reach Your Goal
21. Impulse Control: Saying No to Yourself
22. Planning for the Restaurant Experience (No written lesson)
23. Evaluating Your Restaurant Experience
24. Autobiographical Statement
25. Assessing Your Progress and Motivating Yourself for Lasting Weight Loss
26. Final Assessment (No lesson)
27. Advancing into Phase II and Part 2 of Final Assessment

APPENDIX C
MASTERY CRITERIA FOR WOMEN

MASTERY CRITERIA FOR WOMEN

LEVEL

	1	2	3	4	5	6	7	8	9
CALORIC INTAKE (Avg. daily)	1600 (4)	1400 (5)	1400 (6)	1200 (4)	1200 (5)	1200 (6)	1200 (6)	1200 (7)	1200 (7)
FAT EXCHANGES (Max. daily)	None	None	None	3 (4)	3 (5)	3 (5)	3 (6)	3 (6)	3 (6)
SATURATED FATS (# days without)	None	None	None	None	None	None	2	2	2
EXERCISE (total minutes/week)	None	50 (5)	75 (5)	100 (5)	120 (6)	150 (6)	180 (6)	180 (6)	180 (6)
SELF-MONITORING (days/wk, added elements)	7 C	7 E	7	7 F	7	7	7 S	7	7
WEIGHT LOSS (% of initial wgt)	None	1	2	4	6	8	10	12	14
KNOWLEDGE (% correct on quiz)	60%	70%	75%	75%	80%	80%	85%	85%	90%

Note: The number in parentheses for caloric intake, fat intake, and exercise specify the minimum number of days on which the goal in the cell must be achieved.

For Self-Monitoring Criteria:
C = Calories
E = Exercise in minutes
F = Fat Exchanges
S = Saturated Fat Exchanges

APPENDIX D
MASTERY CRITERIA FOR MEN

MASTERY CRITERIA FOR MEN

LEVEL

	1	2	3	4	5	6	7	8	9
CALORIC INTAKE (Avg. daily)	2000 (4)	1800 (5)	1800 (6)	1600 (4)	1500 (5)	1500 (6)	1500 (6)	1500 (7)	1500 (7)
FAT EXCHANGES (Max. daily)	None	None	None	4 (4)	4 (5)	4 (5)	4 (6)	4 (6)	4 (6)
SATURATED FATS (# days without)	None	None	None	None	None	None	2	2	2
EXERCISE (total minutes/week)	None	50 (5)	75 (5)	100 (5)	120 (6)	150 (6)	180 (6)	120 (6)	180 (6)
SELF-MONITORING (days/wk, added elements)	7 C	7 E	7	7 F	7	7	7 S	7	7
WEIGHT LOSS (% of initial wgt)	None	1	2	4	6	8	10	12	14
KNOWLEDGE (% correct on exam)	60%	70%	75%	75%	80%	80%	85%	85%	90%

Note: The number in parentheses for caloric intake, fat intake, and exercise specify the minimum number of days on which the goal in the cell must be achieved.

For Self-Monitoring Criteria:
C = Calories
E = Exercise in minutes
F = Fat Exchanges
S = Saturated Fat Exchanges

REFERENCES

Amatruda, J. M., Richeson, J. F., Welle, S. L., Brodows, R. G., & Lockwood, D. H. (1988). The safety and efficacy of a controlled low-energy ("very-low-calorie") diet in the treatment of non-insulin-dependent diabetes and obesity. Archives of Internal Medicine, 148, 873-877.

American College of Sports Medicine. (1991). Guidelines for exercise testing and exercise prescription (4th ed.). Philadelphia: Lea & Febiger.

American Diabetes Association. (1986). Exchange lists for meal planning. Alexandria, VA: Author.

Babroff, L. (1993). Nutrition and Exercise Knowledge Questionnaire. Unpublished manuscript, University of Florida, Gainesville.

Bandura, A. (1969). Principles of behavior modification. New York: Holt, Rinehart, and Winston.

Bandura, A. (1977). Social learning theory. New York: Prentice-Hall.

Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). Cognitive therapy of depression. New York: Guilford Press.

Beck, A. T., & Steer, R. A. (1987). Beck Depression Inventory Manual. San Antonio, TX: Harcourt Brace Jovanovich, Inc.

Becker, M. H. (1974). The health belief model and sick role behavior. Health Education Monographs, 2, 409.

Bergner, M., Bobbitt, R., Pollard, W., Martin, D., & Gibson, B. (1976). The Sickness Impact Profile: Validation of a health status measure. Medical Care, 14(1), 57-67.

Black, D. R., Coe, W. C., Friesen, J. G., & Wurzmann, A. G. (1984). A minimal intervention for weight control: A cost-effective alternative. Addictive Behaviors, 9, 279-285.

Black, D. R., & Threlfall, W. E. (1986). A stepped approach to weight control: A minimal intervention and a bibliotherapy problem-solving program. Behavior Therapy, 17, 144-157.

Blackburn, G. L., & Kanders, B. S. (1987). Medical evaluation of the obese patient with cardiovascular disease. American Journal of Cardiology, 60, 556-586.

Bouchard, C., Tremblay, A., Leblanc, C., Lortie, G., Savard, R., & Theriault, G. (1983). A method to assess energy expenditure in children and adults. American Journal of Clinical Nutrition, 37, 461-467.

Brownell, K. D. (1982). Obesity: Understanding and treating a serious, prevalent, and refractory disorder. Journal of Consulting and Clinical Psychology, 50, 820-840.

Brownell, K. D., & Kramer, F. M. (1989). Behavioral management of obesity. Medical Clinics of North America, 73, 185-201.

Brownell, K. D., & Jeffery, R. W. (1987). Improving long-term weight loss: Pushing the limits of treatment. Behavior Therapy, 18, 353-374.

Brownell, K. D., & Wadden, T. A. (1992). Etiology and treatment of obesity: Understanding a serious, prevalent, and refractory disorder. Journal of Consulting and Clinical Psychology, 60, 505-517.

Brownell, K. D., & Wadden, T. A. (1986). Behavior therapy for obesity: Modern approaches and better results. In K. D. Brownell & J. P. Foreyt (eds.), Handbook of eating disorders (pp. 180-197). New York: Basic Books.

Buzzard, I. M., & Feskanick, D. (1987). Maintaining a food composition data base for multiple research studies: the NCC food table. In W. M. Rand, C. T. Windham, B. W. Wyse, and V. R. Young (eds.), Food composition data: A user's perspective. New York: The United Nations University.

Catania, A. C. (1984). Learning (2nd ed.). Englewood Cliffs, New Jersey: Prentice-Hall, Inc.

Caterson, I. D. (1990). Management Strategies for Weight Control: Eating, Exercise, and Behaviour. Drugs, 39, 20-32.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. Journal of Health and Social Behavior, 24, 385-396.

Cox, D. J., & Gonder-Frederick, L. (1992). Major developments in behavioral diabetes research. Journal of Consulting and Clinical Psychology, 60, 628-638.

Diener, E., Emmons, R. S., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. Journal of Personality Assessment, 49, 71-75.

Dubbert, P. M. (1992). Exercise in behavioral medicine. Journal of Consulting and Clinical Psychology, 60, 613-618.

Edwards, B. C., Lambert, M. J., Moran, P. W., McCully, T., Smith, K. C., & Ellington, A. G. (1984). A meta-analytic comparison of the Beck Depression Inventory and the Hamilton Rating Scale for Depression as measures of treatment outcome. British Journal of Clinical Psychology, 23, 93-99.

Epstein, L. H. (1992). Role of behavior theory in behavioral medicine. Journal of Consulting and Clinical Psychology, 60, 493-498.

Epstein, L. H., McKenzie, S. J., Valoski, A., Klein, K. R., & Wing, R. R. (1994). Effects of mastery criteria and contingent reinforcement for family-based child weight control. Addictive Behaviors, in press.

Everhart, J. E., Pettitt, D. J., Bennett, P. H., & Knowler, W. C. (1991). Duration of obesity increases the incidence of NIDDM. Diabetes, 41, 235-240.

Ewart, C. K. (1989). Changing dietary behavior: A social action theory approach. Clinical Nutrition, 8, 9-16.

Foreyt, J. P. (1987). Issues in the assessment and treatment of obesity. Journal of Consulting and Clinical Psychology, 55, 677-684.

Foreyt, J. P., & Goodrick, G. K. (1991). Factors common to successful therapy for the obese patient. Medicine and Science in Sports and Exercise, 23, 292-297.

Genuth, S. M. (1979). Supplemented fasting in the treatment of obesity and diabetes. American Journal of Clinical Nutrition, 32, 2579-2586.

Gilson, B., Gilson, J., Bergner, M., Bobbitt, R., Kressel, S., Pollard, W., & Vesselago, M. (1975). The Sickness Impact Profile: Development of an outcome measure of health care. American Journal of Public Health, 65, 1304-1310.

Glasgow, R. E., McCaul, K. D., & Schafer, L. C. (1986). Barriers to regimen adherence among persons with insulin-dependent diabetes. Journal of Behavioral Medicine, 9, 65-77.

Goldberg, R. B. (1981). Lipid disorders in diabetes. Diabetes Care, 4, 561-572.

Gumbiner, B., Polonsky, K. S., Beltz, W. F., Griver, K., Wallace, P., Brechtel, G., & Henry, R. R. (1990). Effects of weight loss and reduced hyperglycemia on the kinetics of insulin secretion in obese non-insulin dependent diabetes mellitus. Journal of Clinical Endocrinology and Metabolism, 70, 1594-1602.

Hammer, R. L., Barrier, C. A., Roundy, E. S., Bradford, J. M., & Fisher, A. G. (1989). Caloric-restricted low-fat diet and exercise in obese women. American Journal of Clinical Nutrition, 49, 77-85.

Harris, M. B., Davidson, M. B., & Bush, M. A. (1988). Exogenous insulin therapy slows weight loss in Type II diabetic patients. International Journal of Obesity, 12, 149-156.

Harris, R., & Linn, M. W. (1985). Health beliefs, compliance, and control of diabetes mellitus. Southern Medical Journal, 78, 162-166.

Heiby, E. M., Gafarian, C. T., & McCann, S. C. (1989). Situational and behavioral correlates of compliance to a diabetic regimen. Journal of Compliance in Health Care, 4, 101-116.

Henry, R. R., Scheaffer, L., & Olefsky, J. M. (1985). Glycemic effects of intensive caloric restriction and isocaloric refeeding in noninsulin-dependent diabetes mellitus. Journal of Clinical Endocrinology and Metabolism, 61, 917-925.

Hubert, H. B., Feinleib, M., McNamara, P. M., & Castelli, W. P. (1983). Obesity as an independent risk factor for cardiovascular disease: A 26-year follow-up of participants in the Framingham heart study. Circulation, 67, 968-977.

Hughes, T. A., Gwynne, J. T., Switzer, B. R., Herbst, C., & White, G. (1984). Effects of caloric restriction and weight loss on glycemic control, insulin release and resistance, and atherosclerotic risk in obese patients with type II diabetes mellitus. American Journal of Medicine, 77, 7-17.

Johnson, S. B. (1990). Adherence behaviors and health status in childhood diabetes. In C. S. Holmes (ed.), Neuropsychological and behavioral aspects of diabetes (pp. 30-57). New York: Springer-Verlag.

Johnson, S. B., Tomer, A., Cunningham, W., & Henretta, J. (1990). Adherence in childhood diabetes: Results of a confirmatory factor analysis. Health Psychology, 9, 493-501.

Kanders, B. S., & Blackburn, G. L. (1992). Reducing primary risk factors by therapeutic weight loss. In T.A. Wadden and T.B. VanItallie (eds.), Treatment of the seriously obese patient (pp. 213-230). New York: Guilford Press.

Kaplan, R. M. (1990). Behavior as the central outcome in health care. American Psychologist, 45, 1211-1220.

Kaplan, R. M., Hartwell, S. L., Wilson, D., & Wallace, J. P. (1987). Effects of diet and exercise interventions on control and quality of life in non-insulin-dependent diabetes mellitus. Journal of General Internal Medicine, 2, 220-228.

Kaplan, R. M., Wilson, D., Hartwell, S., Merino, K. L., & Wallace, J. P. (1985). Prospective evaluation of HDL cholesterol changes after diet and physical conditioning programs for patients with type II diabetes. Diabetes Care, 8, 343-348.

Kayman, S., Bruvold, W., & Stern, J. S. (1990). Maintenance and relapse after weight loss in women: Behavioral aspects. American Journal of Clinical Nutrition, 52, 800-807.

Keller, F. S. (1966). A personal course in psychology. In R. Ulrich, T. Stachnik, & J. Mabry (eds.), Control of human behavior(vol. 1). Glenview, IL: Scott & Forestman.

Keller, F. S. (1968). Good-bye teacher. Journal of Applied Behavior Analysis, 1, 79-89.

Kohl, H. W., Gordon, N. F., Villegas, J. A., & Blair, S. N. (1992). Cardiorespiratory fitness, glycemic status, and mortality risk in men. Diabetes Care, 15, 184-192.

Kramer, F. M., Jeffery, R. W., Forster, J. L., & Snell, M. K. (1989). Long-term follow-up of behavioral treatment for obesity: Patterns of weight regain among men and women. International Journal of Obesity, 13, 123-136.

Kuczmarski, R. J. (1992). Prevalence of overweight and weight gain in the United States. American Journal of Clinical Nutrition, 55, 495S-502S.

Leventhal, H., Zimmerman, R., & Gutmann, M. (1984). Compliance: A self-regulation perspective. In D. Gentry (Ed.) Handbook of behavioral medicine (pp. 369-436). New York: Guilford.

Levy, R. L. (1987). Compliance and clinical practice. In J. A. Blumenthal and D.C. McKee (eds.), Applications in behavioral medicine and health psychology: A clinician's source book (pp. 567-587). Sarasota, FL: Professional Resource Exchange, Inc.

Lips, H. M., & Ng, M. (1985). Use of the Beck Depression Inventory with three non-clinical populations. Canadian Journal of Behavioral Science, 18, 62-74.

Manson, J. E., Stampfer, M. F., Hennekens, C. H., & Willett, W. C. (1987). Body weight and longevity: A reassessment. JAMA, 257, 353-358.

Marston, A. R., Marston, M. R., & Ross, J. (1977). A correspondence program for weight reduction. Obesity and Bariatric Medicine, 6, 140-147.

McCaul, K. D., Glasgow, R. E., & Schafer, L. C. (1987). Diabetes regimen behaviors. Medical Care, 25, 868-881.

Meichenbaum, D., & Turk, D. C. (1987). Facilitating treatment adherence: A practitioner's guidebook. New York: Plenum Press.

Metropolitan Life Insurance Company. (1983). Metropolitan height and weight tables. Statistical bulletin of the Metropolitan Life Insurance Company, 64, 2-9.

Miller, P. M., & Sims, K. L. (1981). Evaluation and component analysis of a comprehensive weight control program. International Journal of Obesity, 5, 57-65.

Miller, W. C. (1991). Diet composition, energy intake, and nutritional status in relation to obesity in men and women. Medicine and Science in Sports and Exercise, 23, 280-284.

Mitchell, D. C. & Shacklock, F. (1991). The Minnesota Nutrition Data System. Nutrition Today, 26(1), 52-53.

Monk, A., Adolphson, S., Hollander, P., & Bergenstal, R. M. (1988). Managing Type II diabetes. Wayzata, MN: DCI Publishing.

National Center for Health Statistics. (1992). Health United States 1991 and Prevention Profile. Hyattsville, Maryland: Public Health Service.

National Cholesterol Education Program Expert Panel. (1988). Report of the National Cholesterol Education Program Expert Panel on detection, evaluation, and treatment of high blood cholesterol in adults. Archives of Internal Medicine, 148, 36-69.

National Institutes of Health. (1987). Consensus development conference on diet and exercise in non-insulin-dependent diabetes mellitus. Diabetes Care, 10, 639-644.

National Research Council. (1989). Diet and health: Implications for reducing chronic disease risk. Washington, DC : National Academy Press.

Nieman, D. C., Butterworth, D. E., Nieman, C. N., Lee, K. E., & Lee, R. D. (1992). Comparison of six microcomputer dietary analysis systems with the USDA Nutrient Data Base for standard reference. Journal of the American Dietetic Association, 92, 48-56.

Nutrition Coordinating Center. (1990). Minnesota Nutrient Data System, version 2.2. Mpls, MN: University of Minnesota.

O'Brien, R.G., & Kaiser, M.K. (1985). MANOVA Method for analyzing repeated measures designs: An extensive primer. Psychological Bulletin, 97, 316-333.

Ohlson, L. O., Larsson, B., Svardsudd, K., Welin, L., Eriksson, H., Wilhemsen, L., Bjorntorp, P., & Tibblin, G. (1985). The influence of body fat distribution on the incidence of diabetes mellitus. Diabetes, 34, 1055-1058.

O'Neil, P. M., & Jarrell, M. P. (1992). Psychological aspects of obesity and dieting. In T.A. Wadden and T.B. VanItallie (eds.), Treatment of the seriously obese patient (pp. 252-270). New York: Guilford Press.

Perri, M. G. (1992). Weight management treatment manual. Unpublished manuscript. University of Florida, Gainesville.

Perri, M. G. (1989). Obesity. In A. M. Nezu and C. M. Nezu (eds.), Clinical decision-making in behavior therapy: A problem-solving perspective (pp. 193-226). Champaign, IL: Research Press.

Perri, M. G. (1987). Maintenance strategies for the management of obesity. In W. G. Johnson (ed.), Advances in eating disorders: Treating and preventing obesity (pp. 174-194). Greenwich, CT: JAI Press.

Perri, M. G., McAdoo, W. G., McAllister, D. A., Lauer, J. B., & Yancey, D. Z. (1986). Enhancing the efficacy of behavior therapy for obesity: Effects of aerobic exercise and a multicomponent maintenance program. Journal of Consulting and Clinical Psychology, 54, 670-675.

Perri, M. G., McAllister, D. A., Gange, J. J., Jordan, R. C., McAdoo, W. G., & Nezu, A. M. (1988). Effects of four maintenance programs on the long-term maintenance of obesity. Journal of Consulting and Clinical Psychology, 56, 529-534.

Perri, M. G., Nezu, A. M., Patti, E. T., & McCann, K. L. (1989). Effect of length of treatment on weight loss. Journal of Consulting and Clinical Psychology, 57, 450-452.

Perri, M. G., Nezu, A. M., & Viegener, B. J. (1992). Improving the long-term management of obesity: Theory, research, and clinical guidelines. New York: John Wiley and Sons.

Perri, M. G., Sears, S. B., & Clark, J. E. (1993). Strategies for improving the maintenance of weight loss: Toward a continuous care model of obesity management. Diabetes Care, 16, 200-209.

Pezzot-Pearce, T. D., LeBow, M.D., & Pearce, J. W. (1982). Increasing the cost-effectiveness in obesity treatment through use of self-help behavioral manuals and decreased therapist contact. Journal of Consulting and Clinical Psychology, 50, 448-449.

Robinson, J.I., Hoerr, S. L., Strandmark, H., & Mavis, B. (1993). Obesity, weight loss, and health. Journal of the American Dietetic Association, 93, 445-449.

Safer, D. J. (1991). Diet, behavior modification, and exercise: A review of obesity treatments from a long-term perspective. Southern Medical Journal, 84, 1470-1474.

Salata, R., Marcus, M. D., Nowalk, M., & Blair, E. H. (1986). Mood and glycemic control in Type II diabetic patients in behavioral weight control programs. Diabetes, 35, 21A.

Schakel, S. F., Sievert, Y. A., & Buzzard, I. M. (1988). Sources of data for developing and maintaining a nutrient database. Journal of the American Dietetic Association, 88, 1268-1271.

Sherman, W. M., & Albright, A. (1992). Exercise and Type II diabetes. Sports Science Exchange, 4 (37).

Sjostrom, L. (1992). Mortality of severely obese subjects. American Journal of Clinical Nutrition, 55, 516-523S.

Skinner, B. F. (1953). Science and human behavior. New York: MacMillan Publishing Company.

Smoller, J. W., Wadden, T. A., and Stunkard, A. J. (1987). Dieting and depression: A critical review. Journal of Psychosomatic Research, 31, 421-440.

Society of Actuaries and Association of Life Insurance Medical Directors of America. (1980). Build study of 1979. Chicago, IL: Author.

Stalonas, P. M., Johnson, W. G., & Christ, M. (1978). Behaviour modification for obesity: The evaluation of exercise, contingency management, and programme evaluation. Journal of Consulting and Clinical Psychology, 46, 463-469.

Stalonas, P. M., Perri, M. G., & Kerzner, A. B. (1989). Do behavioral treatments of obesity last? A five-year follow-up investigation. Addictive Behaviors, 9, 175-184.

Steer, R. A., Beck, A. T., Riskind, J., & Brown, G. (1986). Differentiation of depressive disorders from generalized anxiety by the Beck Depression Inventory. Journal of Clinical Psychology, 40, 475-478.

Stunkard, A. J. (1957). The dieting depression: Untoward responses to weight reduction. American Journal of Medicine, 23, 77-86.

Stunkard, A. J. (1976). The pain of obesity. Palo Alto, CA: Bull Publishing.

Stunkard, A. J. (1987). Conservative treatments for obesity. American Journal of Clinical Nutrition, 45, 1142-1154.

Stunkard, A. J. (1992). An overview of current treatments for obesity. In T.A. Wadden and T.B. VanItallie (eds.), Treatment of the seriously obese patient (pp. 33-43). New York: Guilford Press.

Stunkard, A. J., & Rush, A. J. (1974). Dieting and depression reexamined: A critical review of reports of untoward responses during weight reduction for obesity. Annals of Internal Medicine, 81, 526-533.

Tremblay, A., Despres, J. P., Maheux, J., Poulioy, M. C., Nadeau, A., Moorjani, S., Lupien, P. J., & Bouchard, C. (1991). Normalization of the metabolic profile in obese women by exercise and a low fat diet. Medical Science and Sports Exercise, 23, 1326-1331.

University Group Diabetes Project. (1971). Effects of hypoglycemic agents on vascular complications in patients with adult-onset diabetes. Journal of the American Medical Association, 218, 1400.

Van Dale, D., Saris, W. H., & Hoor, F. T. (1990). Weight maintenance and resting metabolic rate 18-24 months after a diet/exercise treatment. International Journal of Obesity, 14, 347-359.

VanItallie, T. B. (1985). Health implications of overweight and obesity in the United States. Annals of Internal Medicine, 103, 983-988.

Wadden, T. A., & Bell, S. T. (1990). Obesity. In A. S. Bellack, M. Hersen, and A. E. Kazdin (eds.), International handbook of behavior modification and therapy (Vol. 2, pp. 449-473). New York: Plenum.

Wadden, T. A., Sternberg, J. A., Letizia, K. A., Stunkard, A. J., & Foster, G. A. (1989). Treatment of obesity by very low calorie diet, behavior therapy, and their combination: A five-year Perspective. International Journal of Obesity, 13, 39-46.

Wadden, T. A., & Stunkard, A. J. (1986). Controlled trial of very low calorie, behavior therapy, and their combination in the treatment of obesity. Journal of Consulting and Clinical Psychology, 56, 925-928.

Wadden, T. A., & Stunkard, A. J. (1985). Social and psychological consequences of obesity. Annals of Internal Medicine, 103, 1062-1067.

Willett, W. C., Stampfer, M. J., Colditz, G. A., Rosner, B. A., Hennekens, C. H., & Speizer, F. E. (1987). Dietary fat and the risk of breast cancer. New England Journal of Medicine, 316, 22-28.

Wilson, W., Ary, D. V., Biglan, A., Glasgow, R. E., Toobert, D. J., & Campbell, D. R. (1986). Psychosocial predictors of self-care behaviors (compliance) and glycemic control in non-insulin dependent diabetes mellitus. Diabetes Care, 9, 614-622.

Wing, R. R. (1992). Behavioral treatment of severe obesity. American Journal of Clinical Nutrition, 55, 545-551.

Wing, R. R., Epstein, L. H., & Marcus, M. D. (1990). Behavioral strategies for improving weight loss in obese Type II diabetic patients. In C.S. Holmes (ed.), Neuropsychological and behavioral aspects of diabetes (pp. 198-221). New York: Springer-Verlag.

Wing, R. R., Epstein, L. H., Marcus, M. D., & Kupfer, D. J. (1984). Mood changes in behavioral weight loss programs. Journal of Psychosomatic Research, 28, 189-196.

Wing, R. R., Epstein, L. H., Nowalk, M. P., Koeske, R., & Hagg, S. (1985). Behavior change, weight loss, and physiological improvements in Type II diabetic patients. Journal of Consulting and Clinical Psychology, 53, 111-122.

Wing, R. R., Epstein, L. H., Paternostro-Bayles, M., Kriska, A., Nowalk, M. P., & Gooding, W. (1988). Exercise in a behavioural weight control programme for obese patients with Type 2 (non-insulin-dependent) diabetes. Diabetologia, 31, 902-909.

Wing, R. R., Koeske, R., Epstein, L. H., Nowalk, M. P., Gooding, W., & Becker, D. (1987). Long-term effects of modest weight loss in Type II diabetic patients. Archives of Internal Medicine, 147, 1749-1753.

Wing, R. R., Marcus, M. D., Blair, E. H., & Burton, L. R. (1991). Psychological responses of obese type II diabetic subjects to very-low-calorie diet. Diabetes Care, 14, 596-599.

Wing, R. R., Marcus, M. D., & Bononi, P. (1990). Glycemic control after weight loss is affected by how weight loss is achieved. Diabetes, 39, 50A.

Wing, R. R., Marcus, M. D., Epstein, L. H., & Salata, R. (1987). Type II diabetic subjects lose less weight than their overweight nondiabetic spouses. Diabetes Care, 10, 563-566.

Wing, R. R., Marcus, M. D., Salata, R., Epstein, L. H., Miaskiewicz, S., & Blair, E. H. (1991). Effects of a very-low-calorie diet on long-term glycemic control in obese Type 2 diabetic subjects. Archives of Internal Medicine, 151, 1334-1340.

Wing, R. R., Nowalk, M. P., Epstein, L. H., & Koeske, R. (1986). Calorie-counting compared to exchange system diets in the treatment of overweight patients with Type II diabetes. Addictive Behaviors, 11, 163-168.

Wing, R. R., Shoemaker, M., Marcus, M. D., McDermott, M., & Gooding, W. (1990). Variables associated with weight loss and improvements in glycemic control in Type II diabetic patients in behavioral weight control programs. International Journal of Obesity, 14, 495-503.

BIOGRAPHICAL SKETCH

Pamela Ruth Fuller was born in Edina, Minnesota, on April 6, 1966, and was raised in Plymouth, Minnesota. She received a Bachelor of Science degree in psychology from the University of Puget Sound in Tacoma, Washington, in May, 1988. She received a Master of Science degree in psychology from the University of Florida in May, 1992. She is currently completing her internship in clinical psychology at the State University of New York-Health Science Center in Syracuse, New York, along with her husband, Adam Kittinger Fuller. She anticipates completing her doctor of philosophy in psychology in August, 1994.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Michael G. Perri, Chair
Professor of Clinical and Health Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

James H. Johnson
Professor of Clinical and Health Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Suzanne B. Johnson
Professor of Clinical and Health Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Maria B. Grant
Assistant Professor of Endocrinology and Metabolism

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Anatole D. Martin
Assistant Professor of Physical Therapy

This dissertation was submitted to the Graduate Faculty of the College of Health Related Professions and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

August, 1994

Richard R. Gutekunst
Dean, College of Health Related Professions

Dean, Graduate School